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# AN ANATOMICAL
# EXPOSITION
John OF THE – Their
# STRUCTURE
# OF THE
# HUMAN BODY.

BY

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Illuſtrated with COPPER PLATES.

VOL. I.

The THIRD EDITION, Corrected.

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*LONDON:*
Printed for R. WARE, J. and P. KNAPTON, S. BIRT, T. LONGMAN,
C. HITCH, C. DAVIS, and T. ASTLEY.
MDCCXLIX.

tion to live by any Profeſſion. Pardon thi publick Acknowledgment of Favours whic you deſigned to have kept always ſecret; an continue to believe me with the utmoſt Sir cerity, Gratitude and Reſpect,

SIR,

*Your Moſt Dutiful,*

Bow-Lane,
Sept. 5. 1732.

*Moſt Obliged Brother,*

G. DOUGLA

### THE

# AUTHOR'S ADVERTISEMENT.

IN room of a Preface which I once intended, the following Advertiſement will be ſufficient to inform my Readers, concerning the Deſign and Diſpoſition of this Treatiſe, and concerning ſeveral other particular Circumſtances which it is proper they ſhould be acquainted with, before they begin to peruſe it.

I intitle this Work, *An Anatomical Expoſition of the Structure of the Human Body*, becauſe my Deſign is ſimply to relate that Structure, as I have found it by Diſſections often repeated, and in different Manners; and becauſe I confine my ſelf intirely to the Human Body. I have not enlarged very much on the Uſes of the Parts; I mention thoſe alone, which appear to me to be well founded on the known Structure of the Body; and ſometimes I ſay nothing of them at all, as knowing nothing certain about them. In that Caſe, I frankly acknowledge my Ignorance, in order to excite others who, perhaps, may be more lucky than I have been; and I deſign in another Work, to give a fuller Account of theſe Uſes.

I have followed the ſame general Order which is obſerved by *Veſalius* in his great Work *De Corporis Humani Fabrica*; beginning by the Bones, and from thence going on to the Muſcles, Arteries, Veins, Nerves, Abdomen, Thorax, and Head, together with the Organs of Senſation; and I more willingly pitched upon this Method, becauſe I formerly deſigned to have publiſhed a *Veſalius Renovatus*.

IT is for this Reaſon, that the particular Treatiſe, which I call a Compendious View, *&c.* Sect. 7. is placed where, in all appearance, it ought not to be; and that I have been obliged to make this Compendious View, partly a Recapitulation of the Sections that go before it, and partly an Introduction to thoſe that come after.

MY great Care has been to follow an eaſy, ſimple, and inſtructive Method, for the ſake of Beginners, and of thoſe who have not made any great Progreſs in Anatomy. I never talk of Parts ſuppoſed to be unknown, while I deſcribe the reſt; and I never begin the particular Deſcription of any Part, without giving firſt of all a general Idea of it.

THUS in the Treatiſe of the Muſcles, I confine my ſelf to thoſe which are wholly inſerted in Bones, becauſe in the foregoing Sections, I deſcribed the Bones. I mention no Muſcles fixed in other Organs or Viſcera, as for Inſtance thoſe of the Eye, becauſe that Organ was not deſcribed before; and therefore it would be impoſſible for a Beginner to underſtand my meaning? eſpecially in naming the particular Portions of the Eye, in which the ſeveral Muſcles are fixed.

I have obſerved the ſame Method through this whole Work, paſſing always from known Parts, to thoſe that are unknown; and I have ſhunned, as much as was poſſible, entering upon particular Deſcriptions, till I have firſt communicated general Ideas, as may be ſeen by the Advertiſements inſerted in each Section, on this Subject.

IT was on this Account, that I placed the Deſcription of the freſh Bones with all that belongs to them, immediately after that of the Skeleton; in doing which, I had chiefly regard to the Muſcles wholly fixed in Bones; ſeveral of which are not inſerted immediately in the Bones themſelves, but by the Intervention of a Ligament, Aponeuroſis, *&c.*

I am apt to think I have done a great Service to Beginners, in compoſing two particular Tables, in order to facilitate the Knowledge of the Muſcles; one of which ſhews at firſt ſight, in how many Bones each particular Muſcle is inſerted; the other, to how many Muſcles each Bone gives Inſertion. In the firſt Table, each Muſcle makes a particular Title, under which is a ſimple Enumeration of all the Bones in which it is fixed: In the ſecond, each Bone makes a Title, under which is placed a Liſt of all the Muſcles inſerted in it.

THESE two Tables ſeem, to me, to be of very great Uſe in the Practice both of Phyſick and Surgery, by teaching in a moment, thoſe who have not been much accuſtomed to Diſſections, to how many ſeveral Bones, a wounded or otherwiſe diſordered Muſcle is connected; and likewiſe with how many Muſcles a luxated, fractured, or otherwiſe diſordered Bone is connected, eſpecially when, for want of Time or of Patience, they have not an Opportunity of conſulting the whole Deſcription of the Bone or Muſcle concerned.

IT is with the ſame Deſign, that I have in the Compendious View, *&c.* given a ſhort Enumeration of all the external and internal Parts of the Human Body; adding to each Part, a Liſt of the principal Ramifications of Arteries, Veins and Nerves, which, in their ordinary Courſe, have any Relation, Connexion or Communication therewith. I deſign hereafter to make theſe Liſts more complete, and to diſpoſe them in a better Order.

As it was my Intention, that this Work ſhould be purely dogmatical, and that the Facts ſet down in it, ſhould ſtand intirely on the Credit of my own Obſervations made on Human Bodies, during many Years paſt, I reſolved not to mention a great number of Relations, Hiſtories, foreign Circumſtances, Diſputes, Quotations, *&c.* which may be proper enough in Treatiſes containing only particular Inquiries, Obſervations, Criticiſms and ſuch like.

I am however very far from derogating in the leaſt, from the Merit of any of thoſe great Men and faithful Obſervers, to whom we owe the numerous fine Diſcoveries that have been made, and the excellent Writings, that have been publiſhed. On the contrary, I had reſolved in a larger Work in *Latin*, to place at the Bottom of the Pages, a Sort of Anatomical Chronology, in order to do Juſtice to the true Diſcoveries, and to ſhew that we are often deceived in thinking we have found out ſomething new.

I have not divided this Work into Books and Chapters, but only into ſeveral Treatiſes (or Sections) the Titles of which ſhew what they contain; and I have expreſſed by other particular Titles, the ſeveral Parts or Articles belonging to the Subject of each Treatiſe. I have, for the Eaſe of the Reader, divided the Text of each Section, into a great many different Paragraphs, and there are likewiſe ſmaller Subdiviſions, to which I have prefixed a continued Series of Numbers, which facilitates the References, and will make the Quotations from different Editions, uniform.

As I have reſolved to have no Figures, but what were drawn from the Life, under my own Direction; and as the Impatience of ſeveral Perſons, for whom I have the greateſt Reſpect, would not allow me Time to finiſh the whole Series of thoſe which I have already cauſed to be done; I deſigned to make them the Subject of another Work, which will contain at leaſt fourſcore Folio plates, with a ſhort Explication of each, in *Latin* and *French*. But I foreſee that ſuch a Work will be beyond the power of any one private Perſon.

In the mean time, my friends were of opinion that I ſhould point out in the ſeveral Books of Anatomy, the Figures which I judged to expreſs each Part of the Human Body in the beſt Manner. But I muſt frankly own, that I know but a very ſmall number that are proper for a regular Collection, and even theſe are imperfect in ſome parts; and though theſe Imperfections may be of very little bad Conſequence to good Judges; they may nevertheleſs make falſe Impreſſions on the Imaginations of Beginners, as I ſhall ſhew at a proper time, in a Diſſertation on Anatomical Figures in general, and on thoſe of *Caſſerius,*

rius, *Euſtachius*, *Vidus Vidius* &c. in particular; but I know nothing of the *Roman* Edition of ſeven Figures of the Human Nerves, whic *Riolan* commends ſo much in his Notes on *Veſlingius*.

NOTWITHSTANDING all theſe Reaſons, which determined me t publiſh no Figures at preſent; ſeveral of my Friends having inſiſte very much on the Neceſſity of my having at leaſt a few, I was obliged, at length, to conſent to copy four of *Euſtachius*'s Plates; an as I left them to the Choice of my Friends, they pitched on thoſ which are here inſerted. I cauſed them to be copied from the *Roman* Originals, explained by the late M. *Lanciſi*; and to his Exp tions I have added ſome of my own.

EUSTACHIUS had directed particular Methods for finding the Places in theſe Tables which wanted to be explained; but M. *Manget* who has publiſhed the whole, at the end of his *Theatrum Anatomicum*, has marked the Explications in the common way by Letters and Numbers. This Alteration was approved by *Lanciſi*, an I have here retained it; *Euſtachius*'s Manner not being ſituated to every Perſon's Capacity.

I formerly contrived the following Method for making uſe o thoſe Tables with more eaſe. I draw Squares of five Degrees, wit black Lines, as in the Tables *AA*, *BB*, and afterwards complet theſe Lines with a red tranſparent Liquor, ſuch as the Tincture c *Brazil* Wood, on the Figures themſelves. Then on each large blac and red Square, I draw twenty little Squares, with a yellow tranſparent Liquor, ſuch as the Tincture of Saffron, as I have done in th Table *BB*, by pointed Lines. The uſe of this Contrivance is t find the upper and lateral Degrees to which the Numbers in *Lanciſi* Explications correſpond.

I deſign on ſome other occaſion to give the Obſervations I hav made on what the modern Anatomy has diſcovered to be wantin in theſe Tables, which muſt however always continue to be admire by all true and learned Anatomiſts. The Table *BB* alone was great a Maſter-piece at the time when it was done, as the Tables the Nerves, publiſhed by the late famous *M. Vieuſſens*, ſtill continue be; for no Perſon can ſay that he has hitherto ſeen any better or an ſo good.

I write in a cloſe, conciſe Style, but I have taken all imagin ble pains to render it clear and intelligible, and I have ſhunned a obſcure and equivocal Expreſſions. I have endeavoured after Sim plicity as well as Brevity, and I have continually had theſe two thin in View in compoſing this Work. For as to Brevity, I conſidered that the greateſt Number of thoſe for whom I write, want only the eſſential and neceſſary Parts of this Science; the reſt ſerving only to inhance the Price of my Book, and ſo to hinder them from buying it.

I ſtudied the other Property of Stile, Simplicity, on account of Foreigners, whom I muſt have obliged very much, by ſhunning all ſuch Gallicifms as they muſt be apt to miſtake, who are not perfectly acquainted with the Genius of the *French* Tongue. Theſe Reaſons will, I hope, obtain my Pardon from thoſe who love a voluminous, more than a conciſe Stile, and from thoſe alſo who do not here find all the Politeneſs of which their own Language is capable.

SEVERAL Years ago I was informed, that if I did not publiſh my ſelf, what I had ſaid and demonſtrated in my Courſes of Anatomy, eſpecially in thoſe given at my own Houſe, where I often talk without the leaſt Reſerve, I ſhould have the Mortification to find that ſome other Perſon would do it for me. But nothing of this kind was able to perſuade me, either to precipitate a Work, which is always much eaſier in the Hands of Compilers, that in thoſe of the Author; or not to behave in the ſucceeding Courſes, with my uſual Openneſs of Mind. And I was even ſo indifferent about this Objection, that I have often corrected with my own Hand, what my Scholars had written during my Leſſons and Demonſtrations.

AMONG the great Numbers of thoſe who have attended my Courſes, I have found but very few that have publiſhed as their own, what they learned from me; and I acknowledge with the utmoſt Gratitude, the generous Behaviour of many Foreigners, in relating in their Diſſertations, what they had heard me ſay, either at my own Houſe, in the Phyſick-Schools, or at the Royal-Garden where I was employed by the late great *M. Duvernay*, to teach for twelve Years, his bad State of Health not permitting him to undergo that Fatigue himſelf.

AND upon this occaſion, I cannot help commending the Sincerity of that Gentleman, who tranſlated Dr. *James Douglas*'s *Engliſh Myography* into *Latin*, in declaring in his Notes, that I am the Author of ſeveral Things, which I had only mentioned by Word of Mouth, without having then publiſhed them in Print, and this leads me to take notice of another Inſtance of Sincerity, of a Perſon, who having collected in Writing, all that he could, during ſeveral of my Courſes, put the whole into my hands before he left *Paris*, with this Inſcription: *Hæc tua ſunt*. This Perſon was *M. L'Archevêque*, a Phyſician of *Rouen*.

In the Year 1722, I compoſed a Treatiſe called *Fundamental Anatomy*, and it was ſome Time before Examiners were appointed for that purpoſe; but I afterwards withdrew it and changed it into this which I now publiſh, which differs very much from the other, both in Method and in length. There are a great Number of Errata, owing to the Impatience of the Publick which would not allow me Time to reviſe the Proofs ſo often as I ſhould otherwiſe have done. I beg that theſe Faults may be corrected firſt of all, that my Expreſſions may not be miſtaken, or Errors be imputed to me, of which I am not guilty.

I conclude by acknowledging with ſincere Gratitude, that the late *M. Steno*'s Diſcourſe on the Anatomy of the Brain, was the Sole original Source, and general Rule of my Conduct in all that I have done in Anatomy; and I have inſerted it in the Deſcription of the Head, believing that I ſhould oblige my Readers by reprinting a Piece which was become very ſcarce, and which contains a great many excellent Advices how to ſhun Errors and diſcover Truth, not only in relation to the Structure and Uſes of the Parts, but alſo in relation to the Way of diſſecting, and of making Anatomical Figures.

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THE

# The TRANSLATOR's

# PREFACE.

THE laborious and indefatigable M. *Winſlow*, Author of this Syſtem of Anatomy, has in his Advertiſement, given us a general View of the Plan and Diſpoſition of his Work. My Deſign in this Preface, is to point out a little more particularly, the Excellencies of the Original, and then to give ſome account of the Rules I have obſerved in the Tranſlation.

THIS Work may be conſidered as conſiſting of two Parts; an Enumeration of Phænomena or Matters of Fact, and Concluſions or Inferences drawn from thence concerning the Uſe or Office of the ſeveral Parts of the Body.

THE Order which the Author propoſes to follow through the whole, is to paſs from known Parts to thoſe that are unknown, never to ſuppoſe a Part known, or to mention it as ſuch, till it has been previouſly deſcribed, and never to proceed to the particular Deſcription of a Part, till a general Idea has been given of it. This Order he has ſtrictly obſerved through the whole firſt Volume; but it is not ſo eaſily diſcoverable in all places of the ſecond, and eſpecially in the Deſcription of the Arteries, Veins and Nerves; in tracing the Courſe of which, he is obliged to mention many other Parts beſides the Bones and Muſcles, the only Parts deſcribed in the preceding Sections. Perhaps he was of Opinion that had he avoided this Breach of his propoſed Order he muſt have fallen into other greater Inconveniencies.

THE Author's ſimple, eaſy, unconſtrained and intelligible Method of Expreſſion, adds a very great Beauty to his Work, which is not a little heightened by the continued Series of diſtinct unconnected Numbers, in which each Section is diſpoſed. I have always looked upon the Deſcription of the Human Body, or of any other part of Natural Hiſtory, as on a Book of Geopraphy; the main Buſineſs of which is to relate Obſervations without Ornament, and in ſuch a ſimple manner, as that a Perſon who afterwards views the Countries deſcribed, may be put in the eaſieſt and readieſt way to ſee what the Author ſaw. A laboured Elegancy of Stile, the beautiful Turns of Periods, and a ſtudied Connexion of all the Parts of a Diſcourſe, will undoubtedly render ſuch Deſcriptions moſt pleaſing to a Reader of a polite and claſſical Taſte; but if he deſigns to be more than a Reader, and to conſider his Author in another light than as a Writer of a Romance, that is, if he deſigns to have recourſe to the Originals from which theſe Deſcriptions were taken; he will ſoon find the difference between the native Simplicity and the additional Ornaments of the deſcriptive Stile. *Veſalius*, the moſt elegant Writer in Anatomy ſince *Celſus*'s time, endeavoured to imitate *Cicero* in his Diction; but were *Cicero* to write a Syſtem of Anatomy at this time, he would imitate *Celſus* or *M. Winſlow* and not *Veſalius*.

In the deſcriptive Part of this Work the Author has omitted nothing that has hitherto been diſcovered or verified by himſelf, during a very long Courſe of Anatomical Inquiries, to which his whole Study, Application and time have been devoted; and for which his Genius is admirably fitted, his Encouragement has been the greateſt, and his Opportunities the beſt that *Europe* can afford. And indeed his main Deſign appears every where to have been what he himſelf tells us, in the Introduction to the Hiſtory of the Abdomen, to give a full and accurate Deſcription of the Parts of the Human Body, without entering very far into the Animal Oeconomy or Uſes of the Parts.

The general Idea, by which he begins the Deſcription of each Part, ſerves not only for a good Definition, but when joined to what commonly follows concerning the Figure, Subſtance, Diviſions, &c. of that Part, leads us inſenſibly into the Knowledge of it, and eſpecially lays a Foundation for Underſtanding it's true Situation in the Body; a thing of the greateſt Conſequence in Anatomy, and in which our Author has very much ſurpaſſed all the Anatomical Writers that have gone before him. This important Branch of what he calls the External Conformation of the Parts, is not only excellently deſcribed in this Work, but he has likewiſe every where cautioned Beginners againſt the Miſtakes that have been or may be committed in Diſſections, by deſcribing or delineating the Situation of the Parts from the Parts *extra ſitum*. And undoubtedly Beginners would do well to render themſelves Maſters of theſe more obvious Branches of Anatomy, and eſpecially of the true Situation of the Parts, before they go on to more minute Inquiries, which in order to produce any real Improvement either in Philoſophy or Phyſick, muſt be built on the former as on their only ſolid Foundation. This is the Method followed by *M. Winſlow*, and no better Example can be propoſed for our Imitation. No Anatomiſt has carried the real Knowledge of the inward Structure of the Parts to a greater Length; but he never enters upon that Subject, till their external Conformation has been particularly and accurately deſcribed. Any tolerable Judge of theſe matters will hardly be able to keep from laughing, when he hears a young Pretender to Anatomy talk of making curious Injections, of deciding, by means thereof, the Diſputes that have ariſen concerning the Glandular or Vaſcular Structure of the Brain, or of unfolding the Mechaniſm of a Lymphatic Gland before he knows what Muſcles, large Blood-Veſſels and Nerves lye on any ſide of the Arm or Thigh, and what Space they occupy there, in their natural Situation. Great Pains have been taken to unravel the Structure of the different Coats of the Stomach, in order to explain the manner of Digeſtion, by Perſons who did not know how the two Orifices of that Viſcus are ſituated with reſpect to each other; and we have ſeen thoſe who have ſpent much time in tracing the different Directions of all the Fibres which compoſe the Heart, before they knew how the Heart lies in the Thorax, or in what Direction the great Blood-Veſſels go out from it.

*M. Winſlow* not only deſcribes the outward and inward Structure of the Parts with the greateſt Exactneſs, but likewiſe points out the general Ways of managing theſe Parts in order to ſee what he deſcribes. This is a Duty incumbent on every candid, diligent Anatomiſt, as being the readieſt Way to put others in a Condition to examine and confirm his Obſervations, and to ſave them the time which muſt otherwiſe be unprofitably ſpent in finding out what they might have been eaſily taught by the Authors of theſe Adminiſtrations: and I think I may venture to affirm that *Ruyſch* has loſt more Reputation among the ſincere Lovers of the Progreſs of Natural Knowledge, by concealing the Methods and Materials of his Injections, than he has gained by the Diſcoveries made by them. I am ſorry *M. Winſlow* has not deſcribed his Anatomical Encheireſis at greater length; the Knowledge thereof being the beſt Introduction to the nicer Parts of Anatomy on which that of the Animal Oeconomy mainly depends. This Sort of Encheireſis is what now goes by the name of Experiments, in all the Parts of Natural Philoſophy; and the Skill in contriving theſe Experiments is what puts the chief Difference between an Experimental Philoſopher, who invents Methods how to diſcover Nature; and a Natural Hiſtorian who only collects obvious Phænomena, or thoſe which cannot well eſcape the Eyes, Ears, Fingers, &c. of all who will be at pains to examine them. Obſervations and Collections of this Kind are undoubtedly of uſe, but it is chiefly by the former that Natural Philoſophy has been advanced to that Pitch at which it is our Glory now to find it in *Great Britain.* " Sir *Iſaac Newton* (ſays a very great Man) " was ſenſible that ſomething more than knowing the Name, " the Shape and obvious Qualities of an Inſect, a Pebble, a Plant, " or a Shell, was requiſite to form a Philoſopher, even of the loweſt " Rank .... We all of us remember that Saying, ſo frequently in " his Mouth, That Natural Hiſtory might indeed furniſh Materials " for Natural Philoſophy: but however, Natural Hiſtory was not Na- " tural Philoſophy.... It was not that he deſpiſed ſo uſeful a Branch " of Learning as Natural Hiſtory; he was too wiſe to do ſo: but ſtill " he judged that this humble Handmaid to Philoſophy, though ſhe " might be well employed in amaſſing Implements and Materials for " the Service of her Miſtreſs, yet muſt very much forget herſelf and " the Meanneſs of her Station, if ever ſhe ſhould preſume to claim the " Throne, and arrogate to herſelf the Title of the Queen of Sciences.

Before I leave theſe Reflections on the deſcriptive Part of this Anatomy, I cannot help mentioning a few ſmall Faults into which, I think, the Author has fallen, and which he might have avoided. The firſt conſiſts in too frequent Compariſons of the Figure, Situation and Structure of the Parts of the Human Body, to what belongs to other Arts, no leſs unknown than the Science of Anatomy. I can ſee no Neceſſity for ſuppoſing that every Perſon who begins this Study, is acquainted with Architecture, Fortification, Joinery, Carpenter's Work, Chymiſtry, &c. and I believe all the Readers of this Book will be convinced that the Illuſtrations of the Parts of the Body taken from theſe Arts, are more obſcure than they would have been by a ſimple Deſcription without Compariſons, or by making uſe of ſuch Compariſons only as every one muſt be ſuppoſed to underſtand.

In the next Place, the Author's way of applying Mathematical Terms, is not altogether warrantable: and as few apply themſelves at this Time, either to the Chirurgical or Phyſical Parts of Anatomy, without being previouſly acquainted with ſuch Parts of Mathematics, and of the Application thereof to natural Philoſophy, as are now univerſally acknowledged to be neceſſary for ſuch Studies; I ſhall not be ſurpriſed to hear that Beginners are ſtartled, when they read of an irregular Circle, or Square, of a Fibre or Line tranſverſely Oblique, of a Circular Oval, &c. I muſt therefore beg of them to be ſo indulgent as to believe, that the Author, who is a much better Anatomiſt than Mathematician, deſigned no more by ſuch Expreſſions, than that the Figures or Courſes of the Parts which he deſcribes, come nearer to the Figures and Directions to which he compares them, than to any other.

A third thing in which I think *M. Winſlow* ſomewhat to blame, is in endeavouring to introduce a great number of new Terms of Art without any apparent Neceſſity. The beſt Excuſe that can be pleaded for the numerous Terms of Art already uſed in Anatomy, as well as in the other Sciences, is that by the Help of theſe the Diſcourſe is ſhortened, by expreſſing in one Word what muſt otherwiſe have been expreſſed by ſeveral; and for ſuch things as muſt be mentioned very often, ſuch a Liberty is not only allowable but neceſſary. But then, without pretending to fix the exact Bounds of this Licence, I believe I may venture to affirm, that there is at leaſt a ſufficient number of Terms of Art to be found in the Writers before *M. Winſlow*, and that the Introduction of new Terms amounts now to no more than to oblige Students to learn a Dictionary by heart; that is, to ſpend that Time in the Study of a Language, which might have been more uſefully employed in acquiring the Knowledge of Things.

ANOTHER Liberty often taken by the Author, to ſubſtitute new Terms in the Room of thoſe hitherto univerſally uſed and underſtood among Anatomiſts, is, I think, ſtill more unwarrantable than the former; and the Pretence for it, that the common Terms either convey falſe Ideas of the thing ſignified by them, or do not ſufficiently expreſs the true Ideas, is intirely obviated by this Conſideration, that all Terms are, or ought to be defined, and that the Signification of them in Anatomy ought to be extended no further than theſe Definitions allow of. The Muſcles, for inſtance, hitherto commonly known by the Names of Membranoſus, Palmaris Longus, Plantaris, &c. though better deſcribed by *M. Winſlow*, than they had ever been before, will not in any Reſpect be better underſtood by means of his new Names of Muſculus Faſciæ Latæ, Ulnaris Gracilis, Tibialis Gracilis, &c. Theſe Technical Innovations have been often complained of by the greateſt Writers in other Branches of Phyſick: *Tournefort*'s ſtrongeſt Objection to the famous *Moriſon*, is that he changes the common Names of Plants without Neceſſity; and *Boerhaave*, in his ſecond Catalogue of Plants in the Garden of *Leyden*, deprecates the ſame Fault committed by himſelf in the firſt. But it is ſtill more to our preſent Purpoſe to obſerve, that even *M. Winſlow*, who on all Occaſions ſhews a very great Fondneſs for new Terms, owns nevertheleſs that he is ſometimes obliged to retain the old ones, for the Reaſons already given. Thus, talking of the Muſcles of the Fingers and Toes, he tells us, that though he gives up all Names taken from the Functions commonly attributed to Muſcles, yet the Names taken from the Uſes of ſome Muſcles may ſtill be retained, *provided they be looked upon as proper Names only*;

which Reaſon may be equally applied to all the old Names changed by him, which, as Terms of Art, ought all to be looked upon as proper Names.

WHAT I have hitherto ſaid will be ſufficient to point out, to an attentive Reader, the principal Beauties and ſlight Blemiſhes in the Deſcriptive, that is, in the chief Part of *M. Winſlow*'s Anatomy: The Inferences or Concluſions drawn from the Phænomena he deſcribes, come next in Order. He tells us himſelf, that he has not much inſiſted on the Uſes of the Parts, and that he mentions thoſe only which appear to him to be well founded on the known Structure of the Body; frankly owning his Ignorance, as to thoſe about which he knows nothing certain, in order to excite others, who may perhaps be more luckly in diſcovering them, than he has been. He likewiſe aſſures us in many Places of this Work, that it was deſigned to be purely Anatomical, that is, to contain an accurate Deſcription of the Structure of the Parts; and only to point out their Uſes in general; the farther Proſecution of that curious Subject being reſerved for another Performance. Notwithſtanding theſe repeated Declarations of his Deſign, I am very ſenſible that his not having inſiſted more on the Uſes of the Parts, that is, his not having applied his excellent Deſcriptions at greater length, to the Animal Oeconomy, is made a heavy Charge againſt him by two Sorts of Perſons; by thoſe of a Philoſophical Genius, becauſe they do not here meet with ſo much Philoſophy as they expected from an Anatomiſt of ſo great Reputation; and by thoſe who have been his Scholars at *Paris*, becauſe they do not find all that they have heard him deliver on this Subject in his private Courſes. In anſwer to both, we need only obſerve, that according to our Author, the ſolid Parts of the Body are the chief Subject of a Syſtem of Anatomy, the Fluids being there taken Notice of only occaſionally, or as far as is neceſſary to explain the former; and in the next Place, that the Foundation of a complete Phyſiology, is the Deſcription of the Fluid as well as of the Solid Parts; that is, the Nature, Properties, Motions, &c. of the Chyle, Blood, and all the Liquors ſecreted from the Blood, are to be inquired into and illuſtrated by Hydroſtatical, Chymical and Mechanical Experiments, before the Animal Oeconomy can be explained. Therefore, in a Work deſigned for the Explication of the ſolid Parts only, the Doctrine of the Animal Oeconomy is no farther to be expected, than as the Uſes of the ſolid Parts can be pointed out, without taking in the Conſideration of the Fluids. This our Author has done, and it is very unreaſonable to quarrel with him for not having done more than his Subject led him to, or for not having enlarged his

Subject; in chuſing which, every Writer has always enjoyed, and ought always to enjoy a full and abſolute Liberty. Had he deſcribed the Fluids particularly, and afterwards applied the Deſcription of the Solids and Fluids to the whole Animal OEconomy in a healthful State, it might with equal reaſon ſtill have been objected to him, that he ought likewiſe to have given us the Hiſtory of all the Alterations that happen to theſe Solids and Fluids from various Cauſes variouſly applied, that is, that inſtead of a Deſcription of the ſolid Parts of the Body, he ought to have publiſhed an intire Syſtem of the Theory and Practice of Phyſick.

Upon the whole, notwithſtanding a few ſmall Miſtakes which the Author might have avoided, and notwithſtanding all the other Objections that have been or may be made to his Work, it will be found to contain the beſt Syſtem of the Anatomy of the ſolid Parts of the Body that was ever publiſhed to the World. This was *M. Winſlow*'s ſole Deſign in compoſing it; and by the help thereof, an induſtrious Student may lay an admirable Foundation for underſtanding the Animal OEconomy, and for the Application of that neceſſary Part of Phyſick, to the Knowledge and Cure of Diſeaſes, which every Phyſician ought always to have principally in View in his Inquiries into the Structure and Uſes of the Parts.

I am in the next Place to give ſome Account of the Tranſlation I have made of this excellent Work. Though ſuch a Degree of Knowledge of the *French*, as to be able to read the Books written in that Language with Eaſe and Pleaſure, has for many Years paſt been reckoned an eſſential Part of a polite and liberal Education in *Great-Britain*; yet there are a great many People, who either from Inclination or from the Way of Life which they have choſen, may be ſuppoſed to apply themſelves more or leſs to Anatomical Studies, without being ſufficiently ſkilled in this Faſhionable Language. The Number even of good *French* Books, imported by our Bookſellers, ſeldom over fond of foreign Commodities, is generally very ſmall; and for theſe two Reaſons, a good Tranſlation of a valuable Original ought to be looked upon not only as the moſt proper Way to make the Original more generally known; but alſo as a new Edition of a Book with which we could not otherwiſe be eaſily ſupplied. The ſame Apology will ſerve for good Tranſlations of good Books written in all the other living Languages.

It is laid down as a general Rule, that in all Tranſlations, the Author ought to be made to expreſs himſelf in the ſame Manner as if he had written originally in the Language into which his Work is tranſlated. With reſpect to the dead Languages, eſpecially the *Greek* and *Latin*, I believe this Rule will hold; and I dare ſay every Reader would be very much pleaſed to find in an *Engliſh* Verſion of *Celſus* or *Aretæus*, the ſame Beauties which good Judges have diſcovered in the Originals: but with Reſpect to the *French* Originals this Rule muſt admit of ſome Limitations. Without entering into a particular Detail of the different Genius of the *Engliſh* and *French* Languages, or of the Writers in each Language, it will be ſufficient for my preſent Purpoſe to make two Obſervations; firſt, that the generality of the *French* Writers think themſelves obliged to expreſs a great many Things which the *Engliſh* leave to be ſupplied by their Readers; and ſecondly, that the *French* Words are, in many Caſes, Signs of leſs complex Ideas than the *Engliſh*. From theſe Varieties, which might be very eaſily traced to their true Sources, it follows that the *French* are the beſt Writers on the Elements of Sciences, and that the *Engliſh* Writings are a great deal more conciſe than the *French*. *M. Winſlow*'s Book confirms what I have ſaid; for as no complete Anatomical Treatiſe was ever ſo well calculated for Beginners, ſo had he lived as many Years in *London* as he has lived in *Paris*, his Book would have appeared in a much ſmaller Volume than it does at preſent; and therefore when he tells us that he writes in a cloſe, conciſe Stile, he muſt be ſuppoſed to have compared it only with that of the other *French* Writers in Anatomy; for when compared with that of the Writers in ſeveral other Languages, both dead and living, it is certainly very diffuſed. It would nevertheleſs have been an unpardonable Liberty in an *Engliſh* Tranſlator to have reduced the Original into the ſmall Form in which it might have been written by the Author in that Language; for in that Caſe I ſhould have been thought to have given rather an Abridgment than a Tranſlation of the Original. My chief Buſineſs therefore as a Tranſlator, was to expreſs the Author's Thoughts in his own Way, as far as was conſiſtent with the Propriety of the *Engliſh* Anatomical Stile.

I have given moſt of the Terms of Art in *Latin*, becauſe they are moſt familiarly uſed by *Engliſh* Anatomiſts, in that Language; and for that Reaſon I judge them to be as really *Engliſh* Words as if they had been originally derived to us from the *Britons*, *Saxons*, *Danes*, or *Normans*; for after all the Efforts made, whether by Grammatical or Logical Pedants, Uſe will and muſt remain the ſole Standard both for Speaking and Writing; and Biſhop *Wilkins*'s Project for flying to the Moon was every whit as feaſible as that for eſtabliſhing a Philoſophical Language.

THERE are ſome Words in the Original which cannot well be rendered either by *Latin* or *Engliſh* Terms without a Circumlocution, or without taking ſome other Liberties. *Le Trou Mentonier* in *French* ſignifies the External Orifice of that Canal in the lower Jaw which tranſmits the inferior Maxillary Nerve, or the third Branch of the fifth-Pair: but as there is no Adjective either in *Latin* or *Engliſh* which anſwers to the *French* one *Mentonier*, that Expreſſion cannot be tranſlated without a Circumlocution. The Word *Attache* ſignifies what is commonly called in *Engliſh* both the Origin or Beginning, and Inſertion or Ending of Muſcles; but as I could not, conſiſtently with my Author's Meaning and Deſign, uſe theſe *Engliſh* Words, either indifferently or as they have been commonly uſed hitherto; and as there is no one Word in *Engliſh* that I know of, which expreſſes both Significations of the original Term, I have taken the Liberty to affix that meaning to the Word Inſertion by which I have conſtantly tranſlated the *French Attache* when applied to Muſcles.

On a curſory View of the Original, when I firſt undertook the Tranſlation, I judged that an Alphabetieal Index would have made a very uſeful Supplement to this *Engliſh* Edition; and I deſigned that this Index ſhould have contained ſhort clear Definitions of the principal Anatomical Terms; and theſe, together with the proper References to the particular Sections and Numbers, would have made up a pretty complete Anatomical Dictionary in a ſmall Compaſs. But I ſoon found, in the Progreſs of the Tranſlation, that ſuch an Index would be unneceſſary; for in the firſt Place the Author has explained the principal Terms of Anatomy in the Beginning of Section VII. and the various Tables which he has given us of the Muſcles, Arteries, Veins and Nerves, together with the particular Enumerations of all the Parts of the Body, all which will be eaſily found by the Contents, render any other particular Tables or References, in my Judgment, altogether ſuperfluous. However, as I promiſed an Alphabetical Index in my Propoſals, if thoſe who have done me the Honour to encourage this Undertaking, are not perfectly ſatisfied with my Reaſons for omitting it; I aſſure them that each Subſcriber ſhall have one delivered to him *Gratis*, done with all the Exactneſs that I am capable of.

The want of an Alphabetical Index is one Reaſon why this Edition does not ſwell to the Number of Sheets which I at firſt propoſed; but this is chiefly owing to another Cauſe, which it was not in my power to prevent, I mean the Smallneſs of the Character; and this I was obliged to conſent to that my Bookſeller might not be a Sufferer, in Caſe the other much cheaper Tranſlation, with which we were threatned, had been publiſhed before mine. Whether the Undertakers have deſiſted, or not, I cannot tell; but that ſuch an Undertaking was actually ſet on Foot, I am fully aſſured upon better Grounds than from what was publiſhed in one of the *Engliſh* Journals.

# AN
# Anatomical Expoſition
# OF THE
# STRUCTURE
# OF THE
# HUMAN BODY.

## SECT. I.

### *A Deſcription of the Sceleton or of the dry Bones.*

1. THE exact Knowledge of the Bones is the Foundation of all Anatomy; becauſe without this, we can never have a juſt Idea of the Situation, Diſpoſition, Connexion, and Uſes of the other Parts of the Human Body, nor conſequently underſtand or cure the Diſorders to which they are ſubject. *Introduction.*

2. THIS Science is termed Oſteology, from a *Greek* Word which ſignifies a Diſcourſe or Reaſoning upon the Bones, and it is ordinarily acquired from a Sceleton, that is a Collection of Bones well cleaned and dried, united together in ſuch a Manner as to repreſent, as juſtly as is poſſible, the natural Fabrick of freſh Bones.

3. I ſay as juſtly as is poſſible, becauſe in the freſh Bones we obſerve not only the natural Conſiſtence and Colour of their different Portions, but likewiſe their Cartilages, Ligaments, Membranes, Veſſels, *&c.* as will be ſhown hereafter.

4. BUT ſtill, though the Sceleton does not come perfectly up to the natural ſtructure of freſh Bones, it is both very neceſſary and very uſeful, becauſe

we may readily have Recourſe to it at all Times and in all Seaſons, in order firſt to acquire a preliminary Idea of the Natural State of the Bony Edifice, and afterwards to refreſh our Memory at our Leiſure, eſpecially if we deſire with Eaſe and Pleaſure to reap the Fruit of an Examination or Demonſtration of the Bones in a freſh Subject, i. e. of a particular Oſteology, as it may be termed.

5. My Deſign is to treat of the Bones in both States, beginning by the Hiſtory of the Bones of the Sceleton, or the common Oſteology. I ſhall next deſcribe the freſh Bones taken from dead Bodies newly prepared, which, according to *Riolan*, may be termed *Oſteologia Nova*.

## ART. I.

## *General Doctrine of the Bones.*

*Enumeration of the Bones.* 6. ANATOMISTS commonly begin Oſteology by the general Doctrine of the Bones, but as we cannot avoid mentioning ſeveral particular Portions thereof, as Examples of what we deliver in general, it will be more methodical to give firſt an Idea of the Sceleton by enumerating ſimply all the Pieces of which it is compoſed.

7. After this Enumeration I ſhall lay down what relates to the Bones in general, and then go on to the Deſcription of each dry Bone in particular.

8. In another Place I ſhall give ſome Obſervations on the Proportions which Bones bear to one another, and on the Differences thereof in the two Sexes: but here I ſhall ſpeak only of the dry Bones of an adult Body, that is which has reached the utmoſt Pitch of growth.

9. The Sceleton is a regular Arrangement or Diſpoſition of all the Bones, that is, of all the moſt hard, moſt ſolid, and moſt firm Parts of the Human Body, cleared from the Fleſh, and dried and connected together either by Artificial or Natural Ligaments.

10. The Natural Ligaments ſoon grow hard and inflexible; they hide the Extremities of the Bones, and hinder us from examining each Bone in particular: Therefore the moſt inſtructive Sceletons are thoſe in which the Pieces are joined by Art.

11. The Word Sceleton, according to it's Original, ſeems only to agree to a Collection of dry Bones: It is however applied likewiſe to thoſe which have been but newly cleaned, and which are connected by the Natural Ligaments.

12. The Ordinary and moſt proper Diviſion of the Sceleton is into the Head, Trunk and Extremities.

13. The Head is divided into two general Parts. The firſt is a bony Cavity called the Skull; the other conſiſts of ſeveral Pieces, which form the greateſt Part of the Face; and for this Reaſon probably, they have been termed the Face, though ſome Part of the Skull contributes likewiſe thereto.

14. The Skull conſiſts commonly of eight Bones; one Anterior, called Os Frontis or Bone of the Forehead; one Poſterior, called Os Occipitis or the Occipital Bone; two Superior, called Oſſa Parietalia, or Sincipital or Parietal Bones; two Lateral, called Oſſa Temporum or Temporal Bones; one Inferior, called Os Sphenoidale or the Sphenoidal Bone; and one Interior, called Os Ethmoides or Cribroſum, or the Ethmoidal Bone.

15. Besides theſe, we ſometimes meet with ſupernumerary Bones, the Size and Number of which vary conſiderably.

16. All the Bones which compoſe the Face, in the Senſe already explained, belong to the two Jaws, one upper, the other lower.

17. The Upper Jaw comprehends not only the two large Bones named Oſſa Maxillaria, from the Word Maxilla, by which this Portion of the Face is expreſſed, but likewiſe the two Oſſa Malæ, the two Oſſa Unguis or Lachrymalia, the two Oſſa Naſi, the two Oſſa Palati, the two Oſſa Convoluta or lower Shells of the Noſe, and one ſingle Bone termed Vomer. All theſe amount to thirteen in Number, without reckoning the Teeth, which are commonly ſixteen.

18. The Lower Jaw is but one Bone, with as many Teeth as in the upper.

19. The Trunk is divided in three Parts; one common, called the Spine; and two proper, namely the Thorax or Breaſt and the Pelvis.

20. The Spine is compoſed firſt of twenty four Pieces called Vertebræ, ſeven of which belong to the Neck, twelve to the Back, and five to the Loins; and ſecondly, of the Bone called Os Sacrum, with it's Appendix called Os Coccygis or Coccyx.

21. The Thorax is made up chiefly of the Ribs and Sternum. There are twelve Ribs on each ſide fixed by their poſterior ends to the Vertebræ of the Back, the remaining Parts of the Thorax. The ſeven uppermoſt are called true Ribs, and the five loweſt falſe Ribs.

22. The Sternum conſiſts of two or three pieces lying between the anterior ends of the true Ribs.

23. The Pelvis is principally formed by two great Bones called Oſſa Innominata joined anteriorly to each other, and behind to the Os Sacrum, which completes the Pelvis.

24. The Extremities of the Sceleton are four in number, two upper, one on each ſide the Thorax, and two lower joined to the two ſides of the Pelvis.

25. The upper Extremity is divided into the Shoulder, Arm, Fore-Arm and Hand.

26. The Shoulder is made up of two pieces, one Anterior called Clavicula, and one Poſterior called Scapula. The Arm is only one Bone termed Os Humeri. The Fore-Arm contains two, the Ulna and Radius. The Hand is divided in three parts; the Carpus or Wriſt, conſiſting of eight Bones; the Metacarpus, which is made up of four; and the five Fingers, each of which contains three Bones called Phalanges.

27. Each lower Extremity is divided into the Thigh, the Leg and the Foot.

28. The Thigh is but one Bone, termed Femur or Os Femoris.

29. The Leg is made up of two large Bones, named Tibia and Fibula, and of one ſmall Bone called Patella.

30. The Foot is divided in three parts; the Tarſus, which is made up of the ſeven following Bones, the Os Calcis, Aſtragalus, Os Naviculare, Os Cuboides or Quadratum, and three Oſſa Cuneiformia; the Metatarſus made up of five Bones, and the Toes which are five in number, the greateſt conſiſting of two Bones, and the other four of three Bones each, called Phalanges, as thoſe of the Fingers.

31. There are, beſides theſe, ſome ſmall Bones which are ſeldom met with in a Sceleton, *viz.* the Os Hyoides or Bone of the Tongue, the eight Oſſicula Auditus or Bones of the Ear, four lying in each temporal Bone, the little Bones ſometimes found at the extremities of the Apophyſes Petroſæ towards the Sella Turcica, and the Seſamoidal Bones of the Fingers and Toes, of which two belonging to the great Toe are conſiderable enough to be commonly preſerved in Sceletons.

32. I say nothing of a kind of Seſamoidal Bones found ſometimes on the Condyles of the Femur, at the lower end of the Fibula, at the Os Calcis and at the Os Cuboides.

33. After this Enumeration of the Bones of the Sceleton, it is an eaſy matter to determine their Number: To the Head belong fifty four, without reckoning the Os Hyoides, and Bones of the Ear; to the Trunk, fifty four, taking the Coccyx for one Bone, and the Sternum for two; and to the Extremities, an hundred twenty four, leaving out all the Seſamoidal Bones: ſo that the whole Number is two hundred thirty two; to which if we add the eight Bones of the Ear, and the five principal pieces of the Os Hyoides, we ſhall have in all two hundred forty five, the Seſamoidal Bones being ſtill left out.

34. Before I go on to the particular Examination of each of theſe Bones, it will be proper to conſider them in general, with reſpect, (1.) To their external conformation; (2.) Their inward ſtructure; (3.) Their connexion; and (4.) Their uſes.

*External conformation.* 35. By the external conformation of the Bones, I mean all that may be learnt about them while they remain intire; ſuch as their ſize, figure, external parts and colour.

*Size of Bones.* 36. Some Bones are large, as the Os Humeri, Bones of the Fore-Arm, Os Femoris, Bones of the Leg, Oſſa Innominata: ſome middle-ſized, as many Bones of the Head, the Vertebræ, Ribs, and Bones of the Metacarpus and Metatarſus: others in fine are ſmall, as thoſe of the Carpus, of the Fingers and Toes, the Teeth, *&c.*

*Figure of Bones* 37. Some Bones are long, as the Os Humeri, Bones of the Fore-Arm, the Ribs, *&c.* Some are broad, as the Parietal Bones, the Scapula and Oſſa Innominata; and there are others in which the three dimenſions of length, breadth and thickneſs do not differ much from each other, as the Vertebræ, Bones of the Carpus, Patella, *&c.*

38. Some Bones are Symmetrical, a certain reciprocal Regularity being obſerved between their different ſides; as the Os Frontis, Os Occipitis, Os Sphenoidale, Os Cribroſum, Vomer, the lower Jaw, the Os Hyoides, Vertebræ, Sternum, Os Sacrum, and Coccyx. Theſe Bones are ſingle, being placed in that ſpace which diſtinguiſhes the right ſide of the body from the left.

39. The reſt of the Bones are double or in pairs, whereof one is ſituated on each ſide of the body. Theſe, taken ſingly, have not that Symmetry already mentioned, but when joined to the correſponding Bones on the other ſide, they form a regular figure, as we ſee in the Parietal Bones, Oſſa Humeri, Oſſa Femoris, *&c.* The other varieties remarkable in the figures of Bones will be explained hereafter.

*External parts of a Bone.*

40. The external parts of a Bone may be divided into one principal, which is as it were the body of the Bone; and into four ſubordinate Claſſes termed Regions, Eminences or Riſings, Cavities and Inequalities.

41. The principal part of a Bone is commonly termed it's body, which has been defined to be the middle hardeſt portion, at which the Oſſification of that Bone begins.

42. But this Definition will not hold univerſally; the bodies of the Vertebræ, for inſtance, are neither the middle nor hardeſt parts of them, and the Oſſification of the Oſſa Innominata does not begin at that portion which is the principal part of them in an adult body.

*Eminences of a Bone.*

43. By the Eminences of a Bone I underſtand all ſorts of riſings, prolongations or productions obſervable on it's Surface.

44. These are of two kinds; in the firſt, the riſings are continuous with the reſt of the Bone, and make one piece with it; in the other, they are as it were contiguous only, appearing to be parts added to or united with the body of the Bone.

45. The riſings of the firſt kind are termed Apophyſes, from a *Greek* word ſignifying an Excreſcence, becauſe they grow or ſhoot out immediately from the Bone itſelf; ſuch are the ſharp Eminences of the lower Jaw, *&c.*

46. The others are named Epiphyſes or Appendices, becauſe they appear to be parts added to the reſt of the Bone, and ſtill diſtinguiſhed from it by the intervention of another ſofter ſubſtance called a Cartilage, the thickneſs of which diminiſhing with Age, it becomes at laſt almoſt inſenſible, and is oftentimes quite loſt: ſo that what was an Epiphyſis in a Child, has the true appearance of an Apophyſis in a perſon full grown; as we ſee in the Extremities of the Os Humeri, Bones of the Leg, *&c.*

47. We muſt here obſerve by the bye, that ſome Epiphyſes have Apophyſes belonging to them, as in the lower extremity of the Tibia; and on the contrary, there are Apophyſes which have Epiphyſes joined to them, as in the great Trochanter, and the head of the Os Femoris is really an Epiphyſis of that part of the Bone which is termed it's Neck.

48. Different names have been aſſigned to theſe two kinds of Eminences, taken from the figure, ſituation and uſes.

49. From their Figure they are termed Heads, when they are convex, roundiſh, and ſmooth in their Surface; Necks, when they are ſmalleſt at the middle, and grow gradually bigger towards both ends; Condyles, when two oppoſite Sides of them are flat; Tubercles or Tuberoſities, when they are uneven, rough and irregular; Spines or Spinal Proceſſes, when they are ſharp or pointed.

50. The Name of Spine is ſometimes given to ſmall Tubercles, and alſo to long Riſings with Sharp Edges, which are likewiſe called Criſtæ. There are ſtill other Names taken from the Figure of theſe Eminences, which will be met with hereafter.

51. From their Situation they are called Tranſverſe, Oblique, Upper Lower, *&c.*

52. Some are denominated from their Uſes: thus two Tubercles in the Os Femoris are termed Trochanters, becauſe they ſerve to turn that Bone.

53. A more particular Account of the Eminences of both kinds will be found in the Deſcription of each Bone.

*External Cavities of a Bone.*

54. By Cavities I mean all the Depreſſions perceiveable in the outſides of Bones. Theſe are in great Numbers; very different from one another, and they are called by many different Names.

55. They may however be diſtinguiſhed into two general Kinds; thoſe which receive ſoft Parts, as the Cavities which contain the Brain, the Eyes, the Marrow, *&c.* and thoſe which receive hard Parts, that is, where the Cavity of one Bone contains the Eminence of another. Theſe laſt are either deep or ſuperficial.

56. Of the deep Cavities ſome are termed Cotylæ or Cotyloide, from the Reſemblance they bear to a Veſſel of that Name with which the Ancients meaſured Liquors; ſuch as the great Cavity in the Oſſa Innominata, which receives the Head of the Os Femoris. Others are named Alveoli or Sockets, as thoſe in which the Teeth are lodged.

57. The more ſhallow Cavities are termed Glenæ or Glenoide, from an ancient *Greek* Word; ſuch is that of the Scapula, which receives the Head of the Os Humeri, in the Sceleton. I ſay, in the Sceleton, becauſe in freſh Subjects, this Cavity is deeper, as ſhall be ſaid hereafter. Theſe ſuperficial Cavities have ſcarce any ſenſible Depth, as thoſe in moſt of the Vertebræ, in ſome Bones of the Carpus, Tarſus, *&c.* Some of them are double, as in the upper Extremity of the Tibia.

58. The Cavities which receive ſoft Parts differ from one another in Size, Figure, *&c.* The Names given to them are theſe.

59. Fossa, when the Opening of the Cavity is large or evaſated, as the Orbits in which the Eyes are lodged. When ſuch Cavities are ſmall, they are named Foſſulæ.

60. Sinus, when the Opening of the Cavity is the narroweſt Part of it, as in thoſe at the lower Part of the Os Frontis.

61. Labyrinth, when a Cavity has ſeveral hidden Turnings which communicate with one another.

62. Hole, when a Cavity penetrates from one Side of the Bone to the other.

63. Canal or Duct, when a Cavity runs for ſome conſiderable ſpace in form of a Tube. The Orifices of ſuch Cavities are ſometimes called Holes.

64. When the Cavities are very ſmall and almoſt imperceptible, both they and their Orifices are termed Pores.

65. Slit or Fiſſure, where the Cavity is long, deep and narrow.

66. Notch, a Cavity in the Edge of a Bone from which a piece appears to have been cut out: Groove, a kind of Half-Canal, open, and of a conſiderable Length.

67. And when theſe Half-Canals are ſhallow, narrow and many of them together, they are termed Sulci or Furrows.

68. The Cavities in which Tendons lie, ſuch as that at the upper Part of the Os Humeri, are commonly called Sinuoſities; and thoſe in which only Blood-Veſſels and Nerves are lodged, as we ſee in the Ribs, are termed Sciſſures.

69. These two Terms are very improper, and the Cavities expreſſed by them would be much better named Notches or Grooves. Thoſe through which the Tendons paſs, and which are lined with a particular kind of Cartilage, might be called Channels.

70. It is proper to remark here, that when a Cavity is called Foſſa or Groove, we have no regard to the Situation, but only to the Figure of the things from which theſe terms are borrowed.

71. Besides theſe Cavities which appear on the outward Surface of Bones, there are others internal, which cannot be diſcovered till the Bones have been broken. Theſe we muſt refer to the deſcription of the Internal Structure.

*Superficial Inequalities of Bones.*

72. Among the external parts of Bones (No. 40.) I reckoned the ſuperficial Inequalities which are to be obſerved in them. Of theſe ſome ſerve for the inſertion of Tendons, others for receiving and fixing Muſcles: both kinds were formerly termed Impreſſions, Seats, &c. I have likewiſe choſen to call them Marks, Sides, Traces, &c. adding the Epithets of Ligamentary, Tendinous, Muſcular or Aponeurotick, to expreſs their uſes at the ſame time.

73. These Inequalities augment the Surface of ſome Bones, and render it proportionable to the extent of a Membrane which covers them, called Perioſteum, of which hereafter.

74. Though theſe Inequalities are partly raiſed and partly depreſſed, yet they are too ſuperficial to be ranked among thoſe to which we have given the names of Eminences and Cavities.

*Regions of a Bone.*

75. By the word Region I underſtand certain Portions of the Surface of a Bone, determined in Reſpect of extent, figure, ſituation or other circumſtances.

76. Thus with regard to extent and figure, the long Bones are divided into a middle Part and Extremities; the broad Bones, into Sides, Angles, Baſes and Edges. Theſe Edges are ſometimes termed Coſtæ, ſometimes Criſtæ, and they are ſometimes ſubdivided in two lateral parts called Labia.

77. With regard to Situation, Bones are divided into the upper, middle, lower, anterior, poſterior and lateral parts, and theſe again into external and internal, as occaſion requires.

78. But in order to determine theſe ſeveral parts exactly, the natural Situation thereof ought to be well obſerved, in doing which I ſhall always conſider the Subject in an erect poſture. And indeed it would be proper that this rule ſhould be extended to all the other parts of the body, that the Language of Anatomy might be perfectly uniform, and that one perſon, for inſtance, might no longer call that a Superior Part, which another calls Anterior. Such confuſion may be of very bad conſequence in Reports delivered to Judges.

79. We muſt likewiſe obſerve, that the words Internal and External, beſides their ordinary and natural Signification, are taken in ſeveral other Senſes by Anatomiſts.

80. In ſuch caſes, I ſhall call that part Internal that lies neareſt a Plane, which being ſuppoſed to paſs from the crown of the Head down between the two Heels, divides the Body into the right and left Sides; and the part that is fartheſt from ſuch a Plane, I ſhall name External. Thus the Edge of the Orbit, near the Noſe, is Internal; that near the Temples, External.

81. I ſhall obſerve this rule likewiſe in the parts which compoſe the Extremities; thus I ſhall call that ſide of the Tibia External which is next the Fibula of the ſame Leg, and that Internal which is next the other Leg.

*Colour of a Bone.*

82. The laſt thing to be taken notice of concerning the External conformation of Bones is their Colour, which is not only different in different Bones, but in the different parts of the ſame Bone; but this obſervation relates properly to freſh Bones, and not to the Sceleton.

*Internal ſtructure of Bones.*

83. All that relates to the Internal Structure of Bones may be reduced to two heads, their Subſtance and inward Cavities.

*Subſtance of Bones.*

84. The ſubſtance of Bones is found on Examination to be a texture of ſolid Fibres differently diſpoſed, according to the particular conformation of each Bone. Theſe bony Fibres are eaſily diſtinguiſhed on the Surface of the Ribs, where they may be ſeparated much after the ſame manner as we do thoſe of Whalebone or Horn. We may likewiſe diſcover them by the Fiſſures in Bones which have been long expoſed to the Sun or Air, or any otherways dried.

85. In general theſe Fibres are ſo diſpoſed, as to form in ſome Bones Laminæ of a conſiderable extent; in ſome, little plates or ſmall portions of the forementioned Laminæ; and in others, Filaments of different ſizes.

86. The general Structure of the ſubſtance of Bones conſiſts in this diſpoſition; and their ſubſtance is partly compact or ſolid, partly cellulous or ſpongy, and partly reticular.

87. The ſolid part lies chiefly towards the outſide of Bones, the cellulous part toward the inſide. The firſt is moſt conſiderable in the large hollow Bones, the other in thoſe which have no remarkable Cavities.

88. The ſolid part is formed by Laminæ diſpoſed in different Strata. The ſpongy part conſiſts chiefly of the Plates and Filaments variouſly interwoven: the Filaments alone form the reticular texture principally obſervable in the long hollow Bones.

89. We may be convinced, that the ſolid part of Bones is made up of different Strata of Laminæ, cloſely joined together, by examining broken Bones, thoſe that have been long expoſed to the Air, Rain, or Sun, thoſe that have been calcined by Fire to a certain degree, or thoſe that have been ſoftened by long and violent boiling, as in *Papin*'s Digeſter.

90. And even without the help of ſuch Preparations, the Laminæ in ſome Bones may be ſeen through a good Microſcope; and ſtill plainer in Exfoliations, the coming away of the Splinters of Bones after Wounds, *&c.* The Number of theſe Laminæ anſwers to the thickneſs of the Bone.

91. Gagliardi, Profeſſor of Anatomy at *Rome*, pretends to have obſerved that theſe Laminæ are connected by means of certain ſmall long Bones, which running through them in different places, ſome directly, others obliquely, nail them together like ſo many Pins.

92. These little Bones, he ſays, ſeem to be tranſverſe Epiphyſes of the bony Fibres, of which the Laminæ are compoſed: and that they are of various kinds and figures, ſtrait, crooked, branched, long, and ſhort, and that ſome of them have ſmall heads belonging to them.

93. They appear, according to him, to ariſe from within outward in each Lamina, except a few near the outward Surface of the Bones, the Points of which are turned inwards in a contrary direction to the reſt; in ſuch a manner as that the Nails or Pins ariſing from the internal Laminæ pierce ſeveral of thoſe that lie upon them, and each of theſe again ſend out others which pierce thoſe that ſurround them.

94. Lastly, he ſays, that theſe little Bones are not only of different kinds and figures, but of different orders likewiſe, and that they are found in great numbers, even in the cellular Subſtance of Bones. I cannot here take upon me to form any Judgment of this Doctrine, having been hitherto unable to ſatisfy my ſelf ſo much as about the Exiſtence of theſe little Bones from all the Experiments I have made.

95. To return to the Laminæ, the external may be obſerved to lie in pretty regular Strata; but in the more internal, this diſpoſition is gradually altered, theſe appearing in ſome meaſure to lie in Gathers or unequal Folds. The innermoſt of all are perforated by many Holes of different ſize and figure.

96. In this manner do the Laminæ, which compoſe the ſolid parts of Bones, change their regular Diſpoſition, to form what I call the cellulous or ſpongy part, which makes up almoſt the whole interior Texture of the Bones which have not large Cavities, and of all the Epiphyſes without exception; but in the hollow Bones this part is found only near the Extremities.

97. The Cells or void Spaces in this ſpongy part are more conſiderable in ſome Bones than in others; and the plates which compoſe them differ in form as well as in extent; being more or leſs flat, crooked, twiſted, angular, irregular, thick, thin, broad, narrow, *&c.*

98. In many Bones theſe Plates appear to degenerate into ſmall Filaments, ſo that the cellulous part of ſuch Bones is, as it were, a mixture of

Plates and Filaments, repreſenting a kind of fine Spunge. In ſome Bones, a certain regularity may be obſerved in the diſpoſition of them.

99. Besides the ſmall Filaments found in the cellulous part of Bones, there is a reticular Texture of them in the Cavities of ſeveral long Bones; the bony threads of which net-work are long, fine, branched and pliable, and curiouſly interwoven at different diſtances.

100. This reticular Texture may be ſaid to ariſe partly from the ſides of the innermoſt Laminæ of theſe Bones, partly from their Extremities, and partly from the cellulous Portion. Several Ramifications are produced from it, which appear, as it were, ſuſpended in the Air, through the whole length of the Cavity of the Bone, meeting and uniting together from all quarters, in many places, which, however, are always at a conſiderable diſtance from each other. This Texture is very often deſtroyed in taking out the Marrow, when Bones are deſigned for a Sceleton.

*Internal Cavities of Bones.*

101. Besides the Cavities which appear in examining the external Conformation of Bones, there are others obſervable in examining their internal Structure; which may be all reduced to three kinds, very different from one another.

102. The firſt kind comprehends the large internal Cavities found chiefly in the middle of the long Bones, which are nearly of a cylindrical Figure; ſuch as the Os Humeri, Ulna, Radius, Os Femoris, Tibia, Fibula, the Bones of the Metacarpus, Metatarſus, Fingers and Toes. In theſe the Cavities are proportionable to the length and thickneſs of the Bones.

103. The Surface of theſe Cavities is more ſmooth and even in the middle than near the Extremities, where they become more rough, unequal, and furrowed, according as the diſpoſition of the Laminæ happens to be changed; and bony Productions or croſs pieces may ſometimes be obſerved in them, which are either ſingle or combined together in different manners. The reticular Texture, already deſcribed, is chiefly found in theſe large Cavities.

104. The ſecond kind of internal Cavities conſiſts of the Cells and Intervals in the cellulous Portion of Bones.

105. Of theſe ſome are large, ſmall, ſingle, double, or more compounded, and of theſe laſt ſome contain ſeveral ſmall ones within them. Others are round, flat, oblong, tubular, oval, angular, ſquare, irregular, *&c.* And of theſe the oblong and tubular lie in directions nearly parallel to the length of the Bone. Almoſt all theſe Cells communicate with one another in different manners.

106. The third ſort of internal Cavities comprehends the Ducts and Pores found in the Subſtance of Bones.

107. Of theſe Ducts ſome are very ſmall, and loſe themſelves in the inner Subſtance of the Bone; the reſt are larger, which having penetrated the Subſtance of the Bone for ſome ſpace in an oblique Direction, do afterwards paſs quite through it. Theſe latter are but in ſmall number, and are more ſeldom met with in the middle of Bones than about their Extremities and Edges. The former are very numerous, and lie commonly in a direction parallel to the length or breadth of the bone.

108. The internal Pores, though imperceptible to the Eye, are plainly diſcovered by the yellowiſh matter which tranſudes through Bones long kept without being prepared. *Havers* pretends to have obſerved the particular Diſpoſition of them, but I have never hitherto been ſo lucky.

109. All that has been ſaid about the inward Structure of Bones may be exemplified in the Os Femoris, by ſawing it through the middle lengthwiſe.

110. For thus we diſcover the three different Subſtances very plainly; the middle part conſiſting of a Tube, with thick ſides formed by the compact or ſolid Subſtance alone; the Extremities made up chiefly of the cellulous Subſtance, and the reticular Subſtance obſervable in the Cavity of the middle Part.

111. The Laminæ of the ſolid Part are gradually ſeparated from one another towards the Extremities, being connected by ſmall lateral Plates differently diſpoſed in form of Cells. From this diſpoſition the Laminæ come to be of different lengths, thoſe near the Surface of the Bone reaching to the very end thereof; the reſt, which lie more inwardly, decreaſing gradually in length: thus the innermoſt Lamina is the ſhorteſt; the outermoſt, the longeſt; and the intermediate ones of different lengths between theſe two extremes.

112. For this reaſon the ſolid Subſtance of the Os Femoris is very thick in the middle, but grows gradually thinner towards each end, appearing there only as a bony Cruſt laid over the cellulous Subſtance. It may likewiſe be obſerved, that the moſt interior Laminæ are leſs ſmooth and even than the other, lying, as has been ſaid, in gathers or folds with ſome opening between them, and in a word every way irregular.

113. The ſpongy Subſtance appears clearly enough to be made up of irregular Portions or Fragments of both the internal Laminæ, and of the Extremities of all that lie between theſe and the outermoſt.

114. These Portions of Laminæ, which I call Plates, appear in ſome places to have ſomething of a regular Diſpoſition: for from the middle of the Bone to it's upper Extremity, the Fragments from the outer Laminæ follow nearly the ſame Direction with the Laminæ themſelves; but in thoſe that lie more inward, and are conſequently ſhorter, theſe Plates gradually leave the Circumference of the Bone, and turn towards it's Axis, or that Line which may be imagined to run in the middle of the Bone through it's whole length. From this Diſpoſition, they ſeem to form ſeveral Vaults or Hives placed one upon another, the ſmall diſtances left between them being filled by another numerous Order of little Plates, ſituated ſome more ſome leſs tranſverſely.

115. Below the middle of the Os Femoris, and towards the inferior Extremity, the Fragments are more diſpoſed according to the length of the Bone, and the little Plates which fill up the ſpaces between them are more tranſverſe. It may be remarked likewiſe, that theſe Plates in many places, and principally towards the ends of the Bone, ſeem to degenerate into

ſmall Filaments of different ſizes, which together with the Plates from which they ariſe, repreſent a kind of Spunge.

116. In the cellular Subſtance of both ends of the Bone, ſome Marks of the original Union of it's Epiphyſes are often to be ſeen. In Children each of theſe Marks has a thick Stratum of Cartilaginous Matter, which as they grow up becomes gradually thinner and harder, and at length oſſifies. In many Subjects theſe Marks are totally effaced, the Epiphyſes then becoming true Apophyſes, or at leaſt as difficultly ſeparable from the body of the Bone as Apophyſes are. In other Subjects this Oſſification remains long without being completed, and thus the Epiphyſes may, either by art or accidentally, be looſened and parted from the Bone.

117. The Os Femoris furniſhes us with an example, not only of the three different Subſtances in Bones, but alſo of the different kinds of internal Cavities. We ſee one large Cylindrical Cavity, through the whole length of it's middle part; alſo numerous leſſer Cells of various Figures and Dimenſions formed in the Interſtices of the cellulous Subſtance in both Extremities; and laſtly, little Eyes or Holes in the Interſtices of the reticular Subſtance, and where the Filaments are mingled with the Plates in the ſpongy part. We may likewiſe diſcover the ſmall Ducts, which are either diſtributed through the Subſtance of the Bone, or penetrate it all the way to the Marrow. The exiſtence of the inviſible Pores is likewiſe demonſtrated, through which the Marrow tranſudes, being firſt conveyed through the whole thickneſs of the Bone.

*Connexion of Bones in general.*

118. The Connexion of Bones is a Subject which in all Ages has occaſioned Diſputes, and we find even the beſt Authors divided in their Sentiments about it I ſhall not here give any Hiſtory of theſe Controverſies, but content my ſelf with conveying a ſimple and exact Idea of the thing itſelf, by which the Reader may be in a condition to clear up and remove miſunderſtandings, doubts, and prejudices, and diſtinguiſh what is true and certain from what is falſe and doubtful.

119. In order to this, we need only conſider well the reſemblance between the Structure of the Bones, and that of a Building; or to make the Compariſon more adequate, that of a moving Fabrick, as a Ship, Coach, Clock, or any other ſuch Machine.

120. Every one will agree, that two things are abſolutely neceſſary to put together all the Pieces of which it conſiſts: firſt, they muſt be ſet in their proper places; and ſecondly, they muſt be kept there. To ſet them in their proper places, they muſt be exactly proportioned to each other, whether they be deſigned to remain immoveable as the Beams, Joiſts, Pillars, *&c.* or be contrived for Motion, as the Doors, Windows, Wheels, *&c.* Both theſe kinds of Pieces are formed into different Shapes, that they may agree with one another, and all of them together make a commodious Structure.

121. The ſeveral pieces being thus adjuſted, are afterwards united together in different manners, by glewing, nailing, jointing, lying, hanging, chaining,

ing, &c. ſo that the Methods, both of putting and keeping them together, muſt vary ſuitably to the form, ſituation, and uſe of each piece.

122. It is eaſy to apply what has been ſaid to the Compoſition of the Sceleton, or rather to the natural Fabrick of the Human Bones, which cannot ſerve the purpoſes it is deſigned for, except the ſeveral pieces of which it conſiſts, be fitly adjuſted, and then kept together by different ways. The moſt ancient Oſteologiſts, (ſpeaking only of the perfect Bones of an Adult) called the firſt of theſe Articulation, and the other Symphyſis.

*Articulation of Bones.*

123. Articulation thus underſtood is of two kinds, one moveable, by which the Bones are allowed a certain degree of Motion; the other immoveable, by which they are fixed together without Motion. The firſt is commonly called Diarthroſis, that is, (according to the expreſſion of *Carolus Stephanus*, an ancient Phyſician of the Faculty of *Paris*) an Articulation ſeparated; the other Synarthroſis, or an Articulation conjoined.

124. In the Diarthroſis, or moveable Articulation, the Pieces are really ſeparate; and the parts in which they touch, are each of them covered by a ſmooth Cartilage, by means of which they eaſily ſlide upon one another. In the Synarthroſis, or immoveable Articulation, the Pieces are joined together in ſuch a manner, as that the Parts in which they touch have nothing particular in their Surface, and cannot ſlide upon each other.

125. There is ſtill another Species of Articulation, which cannot well be reduced to either of the two former, becauſe it partakes of both; and therefore I think it neceſſary to eſtabliſh a third kind, by the name of Amphiarthroſis, which agrees better to this ſort, than to the other Articulations, to which it has ſometimes been applied.

*Diarthroſis.*

126. Diarthrosis is either manifeſt with large Motion, or obſcure with ſmall Motion. Each of theſe again is of two kinds, one indeterminate, or with Motion many different ways, as that of the Os Humeri upon the Scapula, of the Os Femoris on the Os Innominatum; the other alternative, or with Motion confined to two oppoſite ſides, as that of the Ulna on the Os Humeri, and of the two laſt Phalanges on the firſt and ſecond.

127. A Bone is ſaid to be moveable many different ways, when it can be turned upwards, and downwards, forwards and backwards, to the right and to the left, and quite round. The Motion quite round is made either on a Pivot, that is about an Axis, or in the manner of a Sling, where the Bone deſcribes a ſort of Cone or the Figure of a Funnel, one end of it moving in a very ſmall Space, the other in a large Circle.

128. The firſt of theſe round Motions is termed Rotation by Anatomiſts; the other is only a Combination of ſeveral Motions upwards, downwards, &c. And it muſt be remarked, that Rotation is not to be met with in all the Articulations for Motion many different ways, *e. g.* the Articulation of the firſt Phalanges with the Metacarpal Bones, &c. does not admit of it.

129. Moreover, this indeterminate Diarthroſis is of two different kinds; one orbicular or globular, the other flat or planiform.

130. The Orbicular Diarthroſis is when the round end of one Bone moves in the Cavity of another, more or leſs proportionable to it, as the Head of the Os Femoris in the Acetabulum of the Os Innominatum; or when the Cavity in one Bone moves upon an Eminence in another, as the Baſes of the firſt Phalanges on the heads of the Metacarpal Bones.

131. The planiform Diarthroſis is when the articulated Bones ſlip upon one another, much in the ſame manner, as when we rub the Palm of one Hand againſt the other: this Articulation is found in the Bones of the Carpus and Tarſus, and in the oblique Proceſſes of the Vertebræ.

132. The Ancients called the firſt of theſe two kinds of Articulation, Enarthroſis; the other, Arthrodia. Some modern *French* Writers ſeem to comprehend both, under the word *Genou*; a term borrowed from Workmen, who, probably, firſt ignorantly took it from the Human Body, to apply it to their Inſtruments. I own that this term, as uſed and explained by them, agrees well enough to all the Degrees of the Orbicular Diarthroſis; but there are undoubtedly many Articulations of the other kind ſo very flat, that a ſkilful Workman would not allow them the name of *Genou*.

133. The alternative or reciprocal Diarthroſis bears ſome reſemblance to a Hinge, and for that reaſon the ancient *Greeks* termed it Ginglymus, which ſignifies the ſame thing; and has accordingly been ſo tranſlated in ſome modern Languages.

134. It has been divided into ſeveral Kinds; but, properly ſpeaking, I think there can be but two. The firſt is that which is confined to Flexion and Extenſion; and as in one of theſe Motions the two Bones always make an Angle, I term it an angular Ginglymus. This is exactly the ſame with the Motion of a Hinge. The ſecond Kind is adapted only to ſmall turns toward each ſide, or to ſmall lateral Rotations, in the Language of Anatomiſts: and therefore I term it a lateral Ginglymus. In each kind ſeveral differences are to be taken notice of.

135. In the angular Ginglymus, either each Bone partly receives, and partly is received by the other, there being reciprocal Eminences and Cavities in each, as in the Articulation of the Os Humeri with the Ulna; or there are only ſeveral Eminences in one Bone, received into the ſame number of Cavities in the other, as in the Articulation of the Os Femoris with the Tibia.

136. The lateral Ginglymus is either ſingle, as in the Articulation of the firſt Vertebra of the Neck, with the Apophyſis Dentiformis of the ſecond; or double, that is, in two different Parts of the Bone, as in the Articulation of the Ulna with the Radius.

137. It muſt in general be obſerved, concerning theſe kinds of Articulations, that ſome of them are more perfect and cloſe than others; and that they are not all confined to Flexion and Extenſion, or to the reciprocal turns already explained, as we ſhall afterwards ſee.

138. The obſcure Diarthroſis, or that which admits only of ſmall Motions, is alſo of different kinds, as ſhall be ſhewn in the particular Deſcription of the Bones. Examples thereof are found in the Articulations of the

the Bones of the Carpus, and Metacarpus, and of the Fibula with the Tibia.

139. This Articulation was formerly called doubtful and neutral, and by ſome Amphiarthroſis, while others reduced it to Synarthroſis. The firſt of theſe Names might paſs, the reſt are improper.

140. Synarthrosis, or the Articulation of Bones ſo joined together, as to remain fixed in their Situation, is of two kinds; one is made by Ingrailing, and the other in the ſame manner as a Nail or Pin is fixed in Wood. The firſt may again be ſubdivided into a deep and more ſuperficial kind. *Synarthroſis.*

141. The deep kind is obſervable in the Articulation of the broad Bones. The Ancients termed it Suture, becauſe of ſome reſemblance it bears to a coarſe Seam, as is ſeen in the upper Bones of the Skull. It is made by Jags, Notches, and Holes in each of the articulated Bones, by which they are mutually indented, much after the ſame manner as what is called Dove-tailing by the Joiners. By the Ancients it was called Unguis, probably becauſe the indented Pieces are rounded like Nails. Sutures have been divided into true and falſe; which ſhall be ſpoke to in deſcribing the Skull.

142. The other kind is that which is obſerved in Bones joined together by more extended Surfaces, in which no Indentation appears outwardly. This the Ancients termed Harmony, and the Articulation of ſome of the Bones of the upper Jaw were given as examples of it. But though they deſcribe it as running in a ſingle Line, they did not mean this in a ſtrict Senſe, but only that the Joint was like that of two rough Boards without Grooves. They have expreſsly told us, that ſome ſmall Inequalities might be obſerved in theſe Joints; and ſome of them have uſed the Terms of Suture and Harmony indifferently.

143. Suture differs very much from Harmony. In the firſt, the Jaggings and Notches are very conſiderable, and the Indentation is made likewiſe by ſmall lateral Eminences therein; ſo that the Bones thus joined, cannot be ſeparated without breaking a great many of theſe Jags and their little Eminences; whereas thoſe that are joined by Harmony, may eaſily be parted without breaking any thing, or at moſt but very little.

144. Harmony differs from Suture, in that the Inequalities therein are very ſmall, their Union is ſuperficial, and there is no appearance of them on the Surface of the Bones; the Joint there repreſenting only a kind of Line, more or leſs irregular.

145. The other kind of Synarthroſis, an Example of which we have in the Articulation of the Teeth, is called Gomphoſis, a *Greek* Term ſtill retained. I ſhall deſcribe it in the Hiſtory of the Bones of the Head, to which both theſe kinds of Synarthroſis peculiarly belong.

146. The third general kind of Articulation partakes of both the former two, the moveable and immoveable; and for that reaſon I have termed it Amphiarthroſis, or the mixt Articulation; as reſembling Diarthroſis in being moveable, and Synarthroſis in it's Connexion. *Amphiarthroſis.*

147. The Pieces which compoſe it have not a particular Cartilage belonging to each of them, as in the Diarthroſis; but they are both united to a common Cartilage, which, being more or leſs pliable, allows them certain degrees of Flexibility, though they cannot ſlide upon each other. Such is the Connexion of the firſt Rib with the Sternum, and of the Bodies of the Vertebræ with each other.

*Symphyſis.* 148. Having examined the Articulation of Bones we come now to conſider their Union or Connexion, properly ſo called, which the Ancients named Symphyſis; taking this Term in an improper or large Senſe, when they applied it to the Connexion of Bones; but in it's proper meaning they uſed it only to ſignify Oſſification.

149. The Authors, who ſay that the Ancients took Symphyſis for a Species of Articulation, miſunderſtand them; neither are they more in the right, who advance, that the Ancients looked upon Articulation and Symphyſis as oppoſite to each other. If they ſpeak of the moſt early Antiquity, both theſe Propoſitions are falſe.

150. In the firſt place, the Ancients do not confound Articulation with Symphyſis, but plainly diſtinguiſh them, taking Articulation for the ſimple ſetting of Bones together, independently of their being connected or kept together. In the ſecond place, they do not look upon theſe two as oppoſites, that is, where they talk of Articulation, they do not exclude Symphyſis; becauſe their Writings clearly ſhew, that in order to compoſe the Sceleton, they thought it neceſſary to bring them both in together.

151. The Words of *Galen* alone are ſufficient to prove this. In general he tells us, "That the Sceleton is a regular Diſpoſition of all the Bones connected together;" and afterwards, "That their Compoſition is by Articulation and Symphyſis: that Articulation conſiſts in the Bones being naturally ranked Symphyſis, in their being naturally connected." In fine, after having enumerated all the Differences of Articulation, he declares in plain Terms, that by Symphyſis, or the Union of Bones, he underſtands not only that, by which two or more Pieces become one by Age, but alſo that, by which the Bones are naturally united and connected together in different Ways. Of theſe he reckons three (as his Predeceſſors had done) by Cartilage, Ligament, and Fleſh. The firſt kind of Symphyſis, they called Synchondroſis; the ſecond, Synneuroſis; and the third, Syſſarcoſis. He likewiſe takes notice, that his Predeceſſors did not take the word Synneuroſis ſo far in a literal Senſe, as if it ſignified the Union of Bones, by means of Nerves; but that they were accuſtomed to call both Ligaments and Tendons by the name of Nerves, though they were very well appriſed of the Diſtinction of theſe three things.

152. The Diſtinction of Symphyſis into that without a Medium, and that with a Medium, can have no place here; for the firſt, of which the Lower Jaw is cited as an Example, belongs not to the Connexion of Bones, but to their Formation while imperfect; and therefore may be called Symphyſis of Oſſification, and the other Symphyſis of Articulation.

153. In another ſenſe, however, this Diviſion may ſtill be made uſe of in this manner. All the Pieces which compoſe the bony Fabrick are naturally connected and united together. This Union or Connexion which, with the Ancients, I term Symphyſis, is either without or with a Medium.

154. Symphysis without a Medium, is where the articulated Bones ſupport themſelves in their Situation, without any other aſſiſtance than that of their Conformation only; thus the Parietal Bones are mutually fixed by their Indentations, and ſo give us at once an Example of Articulation and Symphyſis. In the ſame manner the Bones in the Baſis of the Skull are ſupported by thoſe which make the convex part of it. In a natural State, however, none of theſe Pieces touch one another immediately, but are ſeparated by Membranes which run in between them.

155. The Connexion or Symphyſis of Bones with a Medium, is of three kinds; Cartilaginous, Ligamentary, and Fleſhy or Muſcular: *i. e.* as the Ancients termed them, by Synchondroſis, Synneuroſis, and Syſſarcoſis.

156. Synchondrosis, or the Cartilaginous Symphyſis, is either moveable, as in that by which the Bodies of the Vertebræ are kept together, or which joins the firſt Rib to the Sternum; or immoveable, as that of the Oſſa Pubis, in an ordinary ſtate. The Symphyſis of Oſſification is different from this, and the Union of Epiphyſes belongs to that, rather than to the Symphyſis of Articulation.

157. Synneurosis, or the Ligamentary Symphyſis, is found in all the Joints deſigned for Motion, in the manner that ſhall be ſhewn in treating of the Ligaments.

158. Syssarcosis, or the Muſcular Symphyſis, is as real as the two former, and may be ſaid to be much more general, becauſe it accompanies and ſtrengthens the others, and ſupplies what is wanting in them. The Connexion of the Os Humeri with the Scapula, is a ſufficient proof of this: for the Strength and Security of that Joint is owing more to the Muſcles, than to the Ligaments.

159. Before we end this Article, it is proper to obſerve that the word Symphyſis, taken in the ſenſe of the moſt ancient *Greek* Authors, is not more ridiculous or improper than the word Aponeuroſis, which the Moderns continue to uſe without heſitation for any tendinous Expanſion, though it ſignifies properly a Nervous Expanſion. *Galen* has even made uſe of this term to expreſs all ſorts of Connexions; and when he ſpeaks of that of the Diaphragm to the Ribs, he imploys the Verb from whence it is derived; ſo that if we were at liberty to coin a new *Engliſh* word, we might in his manner ſay, that the Diaphragm ſymphyſed to the Ribs.

*Uſe of the Bones in general.*

160. The Bones are in general, in reſpect to the Body, what a wooden Frame is in reſpect to the whole Building. They give Strength and Poſture to the Body, ſuſtain all it's Organs, and keep the Animal in all ſituations proper for it's Functions, by means of their different Conformation, Structure, and Connexion.

161. The Apophyſes and Epiphyſes dilate the ends of Bones, and thereby increaſe the extent of the articulated Parts. They make more room

for the Inſertion of Muſcles and Ligaments; they change the Direction, and laſtly facilitate the Action of many Muſcles.

162. THE External Cavities receive the Muſcles, direct the Tendons, give paſſage to the Blood-Veſſels, Nerves, and Ligaments, as we ſhall ſhew particularly in deſcribing each Bone.

163. THE Uſes of the internal Structure equally deſerve our Attention. The long hollow Bones are very compact in the middle, and thereby ſecured againſt bending or breaking in great Motions and the Strokes to which they are expoſed. Their Hollowneſs, joined to the Solidity of their Subſtance, increaſes theſe Advantages; and without augmenting their Weight or Quantity of Matter, enables them to bear very great Loads.

164. THE Cellulous Subſtance in the Extremities of theſe Bones, and through the whole Extent of almoſt all the reſt which are not liable to the ſame Dangers, gives them a large Size, with a ſmall Portion of Subſtance; and thereby procures for them a ſufficient Extent, without any ſuperfluous Incumbrance of Weight.

165. THE Reticular Subſtance ſuſtains the Body of Marrow with which the great Cavities are filled, and the Cells of the ſpungy Subſtance ſerve to contain the ſeparate Portions of Medullary Juice, as ſhall be ſhewn in the Hiſtory of freſh Bones.

166 IT is ſufficient to obſerve about the Articulations in general, that the moveable ones ſerve for all the Motions and Changes of Situation of the whole Body, or of it's particular Parts. Thoſe that are immoveable have the ſame uſes which Carpenters or Joiners find in making their Works of many Pieces, when they are to be much expoſed to external Accidents.

167. LASTLY, The Connexion or Symphyſis of Bones ſupports them in their natural State, whether they be deſigned for Motion or not. I ſhall ſpeak to all theſe uſes at more length in the Hiſtory of each Bone, obſerving nearly the ſame order in which I have here mentioned them.

## ART. II.

## *The Bones of the Head.*

### §. 1. *The Bones of the Head in general.*

168. THE Head is compoſed of ſeveral bony Pieces, one part of which by their Connexions form a kind of Oval Capacity properly called the Skull. The other repreſents a complicated Piece of Sculpture, which partly ſupports the anterior half of the Skull, and as it forms the greateſt part of the Face, it is called by that name.

169. BEFORE we examine particularly each Bone of the Head, it is neceſſary, in order to prevent Repetitions and Obſcurity, to conſider the Head in general, that is, as conſiſting of all the Bones that belong to it. In this view, ſeveral Eminences, Cavities, &c. come to be taken notice of, the Formation of which is owing to more Bones than one; and conſequently, in

examining each Bone by itſelf, we can ſee but an imperfect Portion of them.

170. In the Language of Anatomiſts theſe parts may be called common, and thoſe that belong to ſome one Bone only may be termed proper. The common parts ought firſt to be diſtinctly known, before we go on to the proper ones; if we would ſhun an inconveniency otherwiſe inevitable, of explaining one unknown thing by another equally unknown.

171. The bony Head being conſidered as one Piece, the following particulars may be taken notice of in it: 1. It's Situation in general; 2. The Size; 3. The Figure; 4. The external Parts; 5. The internal Structure; 6. The Situation in particular; 7. The Connexion; 8. The Uſes. I ſhall follow the ſame order nearly, through the whole of this Expoſition.

*Situation in general.* 172. The Head is the higheſt or moſt ſuperior Part of the whole Sceleton.

*Figure.* 173. The whole Head of the Sceleton is Spheroidal, compoſed, as it were, of two Ovals, a little depreſſed on each ſide. One of them is ſuperior, the Extremities pointing forward and backward; the other is anterior, the Extremities being turned upward and downward in ſuch a manner, as that one Extremity of each Oval meets and is loſt in the other, at the place particularly known by the name of the Forehead.

174. This complex Figure being viewed ſidewiſe repreſents a Spheroidal Triangle; and we ought further to obſerve about it, that the Oval of the Skull is broader behind than before, and that of the Face broader above than below.

*Regions.* 175. The upper Region is termed the Crown of the Head, the lower, the Baſis; the lateral Regions, the Temples; the Anterior, the Forehead; the Poſterior, the Occiput; the lower part of which is called the Nape of the Neck.

*Eminences. Cavities. Inequalities.* 176. Some of the Eminences, Cavities, and Inequalities are External, being viſible in an intire Head; others are Internal, and can only be diſcovered by opening the Skull. Both theſe kinds are either proper, belonging only to ſome one Piece; or common to more Pieces than one.

*External Eminences.* 177. The External Eminences are ten in number, two Maſtoide, two Styloide, two Condyloide, two Pterygoide, and two Arches, called Zygomata. Of theſe five Pairs, the three firſt are ſimple or proper; the other two, *viz.* the Zygomata and Pterygoides are compound or common, being formed by the Connexion of more Bones than one; the Zygomata by the Oſſa Temporum, and Oſſa Malarum; the Pterygoide Eminences by the Os Sphenoides and Oſſa Palati. To theſe may be added the Tubercle and external Spine of the Occiput, and the Condyloide and Coronoide Apophyſes of the lower Jaw.

*Simple External Cavities.* 178. The ſimple external Cavities are, the Parietal Holes; the Superciliary Holes, in place of which there are ſometimes only Notches; the ſuperior orbitary Slits; the Optick Holes; the external, or rather inferior Orbitary Holes; the Holes in the Oſſa Naſi; the Holes in the Oſſa Malarum;

the Maxillary Foſſæ; the Oval Holes in the Baſis of the Skull; the Spinal Holes; the Orifices of the Paſſages of the internal Carotides; the Maſtoide Grooves; the Stylomaſtoide Holes; the poſterior Maſtoide Holes; the large Occipital Hole; the anterior and poſterior Condyloide Holes; the Glenoide Cavity and Fiſſure for the Articulation of the lower Jaw; the external Auditory Hole; the ſmall poſterior Maxillary Holes; the Sockets in both Jaws; the internal and external Orifices of the Canal of the lower Jaw, which laſt may likewiſe be named the Holes of the Chin.

*Compound external Cavities.*

179. The compound external Cavities are the Orbits, the Edges of which are divided into two lateral parts, improperly called Angles, one internal toward the Noſe, the other external toward the Temples; the Temporal Foſſæ; the Zygomatic and Naſal Cavities, which laſt are alſo called Noſtrils; which have anterior and poſterior Openings, and are parted by a middle Septum; the Vault of the Palate; the anterior Hole of the Palate, or of the Inciſors; the poſterior Holes of the Palate; the Pterygoide Foſſæ; the inferior Orbitary, or Spheno-Maxillary Slits; the interior Orbitary Holes, one anterior, and one poſterior; the Naſal or Lachrymal Duct; the Duct of *Euſtachius*, called the Aqueduct, the ſmall Foſſæ for the internal Jugular Veins; and the Foramina Spheno-Palatina and Lacera.

*Internal Eminences.*

180. The internal Eminences are the Frontal or Coronal Spine; Criſta Galli; the Sella Turcica or Sphenoidalis; the Clinoide Apophyſes, Apophyſes Petroſæ; the internal Occipital Spine; the Crucial Tubercle, and two lateral Criſtæ.

*Internal Cavities.*

181. Of the internal Cavities, one is ſimple, the bottom of the Sella Sphenoidalis, called Foſſa Pituitaria. The reſt are compound, *viz.* eight large Foſſæ in the Baſis of the Skull, two anterior, two middle; and on the backſide, two upper, and two lower: The Grooves of the ſuperior longitudinal and of the lateral Sinuſſes, and the Sulci of the Arteries of the Dura Mater.

*External Inequalities.*

182. The external Inequalities are two large ſemicircular Planes ſurrounding the Temples, one on each ſide; the Edge or Circumference of which begins by a ſort of Criſta or Spine above the external Angle of the Orbit, and ends in two Arches; one on the foreſide, the other on the backſide of the Maſtoide Proceſs; two Occipital Arches, one ſuperior, the other inferior, which are both divided into two Portions by the Occipital Criſta or Spine; the external Veſtiges of the Sutures, &c.

*Internal Inequalities.*

183. The internal Inequalities are the undulated Impreſſions in the Baſis of the Skull; the internal Veſtiges of the Sutures, &c.

*Subſtance.*

184. The compact or ſolid Subſtance of the Bones of the Skull is called Table, of which one is External, and another Internal, called alſo the Vitreous Table, as being more brittle than the former, becauſe it is of a more cloſe Texture.

185. The ſpungy or cellulous ſubſtance between the two Tables is named Diploë, the quantity of which is proportionable to the thickneſs of the Bones. In ſome places it is wanting, and there the Tables uniting, are ſomething tranſparent, as in the temporal Bones, &c. In the internal

Table there are ſeveral conſiderable Depreſſions, ſome of them near a quarter of an Inch in depth, which run in through the Diploë, and even reach the outer Table. Theſe Depreſſions deſerve to be taken notice of in relation to the Operation of trepanning.

*Situation in particular.*

186. By the Situation of the Head in particular, I underſtand the natural Poſture of it, when a Man ſtands, or ſits, without inclining his Head either backwards or forwards, to one ſide or the other, or drawing it down upon the Neck or Shoulders. Particular regard ought to be had to this Situation in examining the Head, either in general or in particular; and eſpecially in conſidering the lower parts of the Baſis of the Skull, and Arch of the Palate.

187. The common Method of ſhewing theſe parts in a Skull turned upſide down, has often occaſioned even expert Anatomiſts to miſtake the upper Parts for the lower, and the lower for the upper. Therefore it is very neceſſary for beginners often to hold the Sceleton of a Head raiſed, in it's true Poſture, and to view it from below upwards, that they may frame to themſelves a juſt Idea of it.

188. In order to this, whether the Head be held in our hands, or ſet upon any thing elſe, the beſt way I have as yet hit upon, is to place the two Zygomatic Arches in a plane exactly parallel to the Horizon. An Head divided into two equal lateral Parts, is likewiſe of great uſe in determining the true ſituation of the Parts I have mentioned, and of thoſe that lie near them.

*Connexion.*

189. The Connexion of the Head with the Trunk is by Ginglymus; the Condyloide Proceſſes of the Os Occipitis being received in the ſuperior Cavities of the firſt Vertebræ of the Neck. The Connexion of the particular Bones of the Head with each other is partly by Diarthroſis, as in the Articulation of the lower Jaw; partly by Synarthroſis, which obtains in the Articulation of all the other Bones, as ſhall be ſhewn hereafter.

*Uſes.*

190. The principal Uſes of the Bones of the Head are to contain the Brain, to be the Seat of the Organs of Senſation, and to ſerve for Maſtication, Reſpiration, the Voice, &c.

### §. 2. *The Bones of the Skull in particular, and firſt, the Os Frontis.*

191. The eight principal Bones of the Skull are ordinarily divided into common and proper. By proper Bones, Anatomiſts mean thoſe which are wholly imployed in forming the Globe of the Skull; and of theſe they reckon ſix, the Os Frontis, two Parietal Bones, the Occipital Bone, and two Oſſa Temporum. The common Bones are thoſe which contribute to form the Face as well as the Skull, *viz.* the Os Ethmoides, and Os Sphenoides.

192. This Diviſion is not juſt, for the Os Frontis and Oſſa Temporum deſerve as much to be called common, as the two that are reckoned ſuch; and thus, inſtead of ſix, there would be only three proper Bones, the Oſſa Parietalia, and Os Occipitis; and inſtead of two, there would be five common ones; the Os Frontis, two Oſſa Temporum, the Os Ethmoides and Os Sphenoides.

*Situation of the Os Frontis in general.* 193. The Os Frontis is ſituated in the anterior part of the Skull, and forms that part of the Face, which is called the Forehead, from whence it has it's Name.

*Figure.* 194. It's Figure is Symmetrical, reſembling a large Shell almoſt round; ſo that two frontal Bones of the ſame ſize joined together, repreſent one ſort of Shell-Fiſh pretty exactly.

*Diviſion.* 195. Before we ſpeak of the parts of this Bone, we muſt take notice, that though it is always looked upon as one Bone, it is ſometimes found to be divided into two equal Parts, by a continuation of the ſagittal Suture, and this Diviſion is common to both Sexes equally.

*Regions.* 196. When we conſider it as one Bone, it may be divided into an upper Part, which belongs to the Crown of the Head; a lower Part, which belongs to the Baſis of the Skull; an anterior Part, which is the Forehead; and two lateral Parts, at which the Temples begin.

197. It has two ſides, one external, which forms the Forehead, the greateſt Part of it being convex; and one internal, which is concave in proportion. By external I here mean what appears when the Skull is intire; and by internal, what cannot be ſeen till the Skull is opened.

*External Eminences.* 198. On the outſide we obſerve the following Eminences; two ſuperciliary Arches which form the upper Edge of each Orbit, or the Supercilia; three riſings not always equally apparent, one between the two Arches, and the other two above the Arches, which may be called the Knobs of the Forehead: five Apophyſes, one at the Extremities of each Arch; one between the Orbits which ſuſtain the Oſſa Naſi, and which in ſome ſubjects makes a part of the bony Septum of the Noſe. This laſt I call the Naſal Apophyſis, and the other four, the Angular Apophyſes.

*External Cavities.* 199. The external Cavities are theſe: two Orbitary Arches or Vaults, forming the upper Portions of the Orbits; a remarkable Depreſſion in each of theſe Vaults, above the external Angle, which contains the Lachrymal Gland; a ſmall Depreſſion above the internal Angle, to which is fixed the Cartilaginous Pully of the great Oblique Muſcle of the Eye; two Portions of the temporal Foſſæ; two little Criſtæ, which form the anterior Extremity of the great ſemicircular Plane of the Temples on each ſide, at the Edge of the ſuperciliary Arches, near the external Angle; two ſuperciliary Foramina, which are ſometimes double, and ſometimes only Notches; and laſtly, two Holes or Portions of Holes, called the internal Orbitary Holes.

*Internal Eminences and Cavities.* 200. On the inſide of this Bone we ſee a ſharp perpendicular Eminence, called the Frontal or Coronal Spine, directly oppoſite to the middle riſing on the outſide already mentioned; above this Spine, a portion of the Groove for the longitudinal Sinus, which, when the Spine is wanting, runs down lower; below the Spine, a conſiderable Opening, called the Ethmoidal Opening, becauſe it contains the Os Ethmoides, the ſides thereof are always more or leſs Cellulous. Between this Opening and the Coronal Spine, a blind Hole which in ſome ſubjects is wholly in the Os Frontis, in others, common to that Bone, and to the Os Ethmoides, and which ſeems to open into the frontal Sinuſſes near the Noſe: the anterior Foſſæ of the Baſis of the Skull, which receive the anterior Lobes of the Brain; and which, by jutting out forwards, form the riſings on the outſide already taken notice of; towards the lower Part, they are uneven, anſwering the Inequalities of the Lobes, and they are alſo a little raiſed to make room for the Orbits: Sulci or Furrows for the Arteries of the Dura Mater, and ſometimes indeterminate Depreſſions, mentioned No. 181. in the general Account of the Head.

*Subſtance and Sinuſſes.*

201. This Bone is compoſed, as has been already obſerved in general, of two Tables and a Diploë, except the orbitrary Vaults, which are very thin and without any Diploë. About the middle of the lower part of the Bone, where the middle riſing is commonly ſituated, the two Tables are parted, to form two Cavities, called the frontal or ſuperciliary Sinuſſes; and the ſeparated Portions are each of them in ſome meaſure compoſed of two Tables, or at leaſt have two Surfaces, which makes in all four Surfaces or Tables.

202. The frontal Sinuſſes are extended on the Edge of the Supercilia, on each ſide, more or leſs, all the way to the ſuperciliary Perforations: below, they are open, and communicate with the Cells of the Os Cribroſum. They are commonly parted by a bony Septum, which is often more to one ſide than to the other, and more or leſs uneven. Sometimes it is perforated; and ſometimes part of it and ſometimes the whole is wanting.

203. In different Subjects, theſe Sinuſſes are obſerved to vary extremely, both in reſpect of their Extent, which in ſome is very ſmall, and in reſpect of their Form, which is often very irregular, and their Diſpoſition cellulous. Sometimes they are intirely wanting, and in ſuch Subjects the internal Cavity of the Noſe is larger than ordinary. It has likewiſe been remarked, that one of them does not open into the Noſe, but only communicates with the other.

*Situation in particular.*

204. To have a juſt Idea of the true Situation of all the parts of this Bone, we ought, in examining or demonſtrating it, to hold it in the ſame Manner as it is ſituated in an intire Head, placed as has been already directed, No. 188. For thus, we ſhall ſee that the upper Part of it is a little inclined backward, and that it's Circumference or Edges are in an inclined Plane.

*Connexion.*

205. The Os Frontis is articulated by Suture, with ſeven other Bones; the Oſſa Parietalia, Os Ethmoides, Os Sphenoides, Oſſa Lachrymalia, Oſſa Naſi, Oſſa Maxillaria and Oſſa Malarum.

*Uſes.*

206. It contains the anterior Lobes of the Brain, and a Portion of the longitudinal Sinus. It forms the Forehead, the upper Part of the Orbits, and a Portion of the Temples.

## §. 3. *Oſſa Parietalia.*

207. The parietal Bones are two in number, one on each ſide, ſituated on the ſuperior, lateral, and a little on the poſterior Parts of the Skull.

*Size and Figure.* 208. They are of a larger Extent than any other Bone of the Skull; their Figure is nearly that of an irregular convex Square.

*Parts.* 209. They have each two Sides, one external and convex, the other internal and concave; four Edges, one ſuperior or Sagittal, one inferior or Temporal, one anterior or Frontal, and one poſterior or Occipital. The ſuperior Edge is the longeſt, the inferior the ſhorteſt, in which there is a very large ſquammous Slope, which I name the temporal Slope. The upper and poſterior Edges are indented through their whole length. The anterior Edge is likewiſe indented, except at the lower Part; all the lower Edge is ſquammous, except a ſmall Portion next the Os Occipitis.

210. It has four Angles, the anterior and upper, the anterior and lower; the poſterior and upper, the poſterior and lower. The anterior and lower Angle ends in a ſquammous Production, which, from it's Situation, I call the temporal Angle or Apophyſis.

211. On the outſide, above the temporal Slope, we ſee the moſt conſiderable Portion of the ſemicircular Plane of the temporal Muſcle. Near the upper Edge, towards the poſterior angle, is a ſmall Hole called the parietal Hole, which is ſometimes found only in one of the Bones, ſometimes in the ſagittal Suture, and ſometimes it is wanting. In ſome Bones, it goes only to the Diploë; in others, it perforates both Tables.

212. The Inſide is ſomething uneven, and many Furrows are remarkable upon it, anſwering to the Ramifications of the Artery of the Dura Mater; the Trunk of which is lodged ſometimes in a Groove, ſometimes in a very ſhort perfect Canal running through the Subſtance of the Bone near the anterior and lower Angle. Near that, another ſuch Canal is ſometimes, though rarely, met with, for another Artery of the Dura Mater.

213. Along the upper Edge of this Inſide, we ſee one half of the ſagittal Groove for the longitudinal Sinus; and at the poſterior and lower Angle we meet generally with a ſmall Portion of another Groove for the lateral Sinus. Laſtly, the ſame ſort of irregular indeterminate Depreſſions are ſometimes obſervable in this Bone, which we took notice of in the Os Frontis.

*Subſtance.* 214. These Bones are the weakeſt of the eight that compoſe the Skull. The Diploë is found between the Tables, through the whole length of the ſagittal and occipital Edges, and through the upper half of the coronal Edge.

*Situation in particular.* 215. To place or demonſtrate this Bone in it's true ſituation, we need only obſerve what has been ſaid concerning it's Edges and Angles, No. 209, 210. remembering only that the poſterior and lower Angle reaches further down than the anterior.

*Connexion.* 216. Each parietal Bone is joined to that on the other ſide, by the ſagittal Suture; to the Os Frontis, by the Coronal Suture; to the Os Occipitis, by the Lambdoidal Suture; and to the Oſſa Temporum and Os Sphenoides, by the ſquammous Suture.

217. It's Connexion with the Os Frontis, below the ſemicircular Plane, is by the ſquammous Suture, and the ſame is to be ſaid of it's Articulation with

the Sphenoidal Bone, as well as with the Oſſa Temporum. The ſquammous Portions of the Os Frontis are covered by thoſe of the Oſſa Parietalia; the ſquammous Slopes in theſe laſt are covered by the Oſſa Temporum; and the ſquammous Apophyſis of the Oſſa Temporum is covered by a Proceſs of the Os Sphenoides.

218. These Bones contain a large Portion of the Brain, form part of the Temples, ſerve for the Inſertion of the temporal Muſcles, &c. *Uſes.*

## §. 4. *Os Occipitis.*

219. The occipital Bone is ſituated in the poſterior and lower Part of the Cranium. *Situation in general.*

220. It repreſents a kind of Loſenge irregularly indented, and yet ſymmetrical, Convex on the outſide and Concave on the other. It conſiſts very rarely of two Pieces divided by the Continuation of the ſagittal Suture. *Figure.*

221. It conſiſts of an external and internal Side; of the upper, lower, lateral, and middle Parts (the firſt four of which may be looked upon as ſo many Angles) of four Edges, two Superior which are indented, and two Inferior, which are more or leſs unequal. *Diviſion.*

222. The outſide is Convex, near the middle of which the occipital Protuberance or riſing is obſervable. Under this Protuberance are two ſuperficial tranſverſe Arches, more remarkable in ſome Subjects, than in others; one Superior and largeſt, the other Inferior and leaſt, and both reaching to the Maſtoide Proceſs on each ſide. The inferior Arch is cut at right Angles by a perpendicular Line, called the external Occipital Spine or Criſta. Under the ſuperior Arch are two rough Planes, one on each ſide of the Spine; and between the Extremities of the two Arches, are two other ſuch Planes, one on the right hand, the other on the left. We ſee likewiſe two Condyles or Condyloide Apophyſes cruſted over with Cartilages, gently convex, of an oblong oval Figure, and ſituated obliquely, their poſterior Extremities being at a greater diſtance from each other than the anterior: alſo a large Cuneiform Production, which, from the Condyles, is directed upwards, and in Adults is often joined inſeparably to the Os Sphenoides; it may be termed Apophyſis Baſilaris, or the great Apophyſis of the Occipital Bone: Laſtly, ſome unequal Tubercles on the lower part of this Apophyſis, and two little angular Productions in the Edge of the Bone over-againſt the Condyles.

223. We are likewiſe to take notice of two large Notches under the lateral Angles, which receive the poſterior Apophyſes of the Oſſa Temporum, two ſmall Notches or Portions of the Jugular Foſſæ, and of the Foramina Lacera; each of which is often divided by a ſmall bony Production: The great Occipital Hole, on the anterior Edge of which there is an Impreſſion for the Inſertion of a Ligament: two anterior and two poſterior Condyloide Foſſulæ: two anterior Condyloide Holes for the ninth Pair of Nerves, which are ſometimes double: two poſterior Condyloide Holes for ſmall Veins, which are ſometimes wanting.

224. The inſide of this Bone is Concave, and there we are to take notice of a crucial Groove, the Edges of which are a little raiſed; the upper Branch contains part of the great longitudinal Sinus of the Dura Mater, the lateral Branches receive the lateral Sinuſſes, and the lower Branch is oftner a Spine or Criſta, than a Groove; it is ſituated oppoſite to the external Spine, and may be called the internal Occipital Spine. It happens often that the Groove for the longitudinal Sinus is more to one ſide than to the other. We ſee alſo the Place where theſe Grooves croſs each other: a conſiderable Tubercle oppoſite to the external Protuberance: four Foſſæ ſeparated by the four Branches of the crucial Groove, two of which contain the poſterior Lobes of the Brain, and the other two, the Cerebellum: a very broad Groove in the Apophyſis Cuneiformis, for the Medulla Oblongata, *&c.* two ſmall Portions of Grooves lower down, which complete the Grooves for the lateral Sinuſſes of the Dura Mater. Along the inner Edge of the large Occipital Hole, there is a kind of Groove more or leſs ſenſible.

*Subſtance.* 225. The upper part of this Bone is very thick, as being much expoſed to blows; the lower part of it is thin, but well guarded by Muſcles. The thickeſt part of the whole Bone is at the Occipital Protuberance, between which and the Tubercle of the crucial Groove, there is a large Quantity of Diploë.

*Situation in particular.* 226. To ſet the occipital Bone in its true Situation, the great Foramen is to be turned downward, and placed horizontally; the Apophyſis Cuneiformis, forward and a little raiſed.

*Connexion.* 227. This Bone is joined on the upper part, to the Oſſa Parietalia, by the Lambdoidal Suture, on the lower and lateral Parts, to the Oſſa Temporum by the Continuation of the Lambdoidal Suture; on the lower and anterior Part, to the Os Sphenoides, by the Apophyſis Cuneiformis, both which in Adults make commonly but one Bone. It is likewiſe joined by a kind of Suture to the ſupernumerary Bones, when there are any ſuch.

*Uſes.* 228. The Os Occipitis forms the back part of the Head; ſerves for the Articulation of the Head with the Trunk; contains a part of the Brain, and almoſt all the Cerebellum; gives paſſage to the Medulla Oblongata, and to a great many Veſſels and Nerves; gives inſertion to a great many Muſcles, *&c.*

## §. 5. *Os Sphenoides.*

*Situation in general.* 229. The Sphenoidal Bone is ſituated in the lower part of the Cranium, a little toward the fore-part, making the middle of the Baſis of the Skull, from whence it got the name of Os Baſilare. It is called Sphenoides or Cuneiforme, becauſe it is in a manner wedged in between the other Bones.

*Figure.* 230. It is of a very odd figure, and yet ſymmetrical. Its greateſt Extent is tranſverſe, and it may in ſome meaſure be ſaid to repreſent a Bat, with its Wings ſpread.

*Diviſion.* 231. It conſiſts of a great number of Parts. The poſterior and thickeſt part, by which it is joined to the Apophyſis of the Os Occipitis, may be called its Body. The reſt is wholly made up of Eminences and Cavities; and in order to examine theſe methodically, the Bones muſt firſt be divided into two Sides, one external, the greateſt part of which may be ſeen in an intire Skull; the other internal, which does not appear till the Skull is opened.

*Eminences on the outſide.*

232. The Eminences on the outſide are theſe: two temporal Apophyſes, which are the largeſt of all the Proceſſes of this Bone, and at the greateſt diſtance from each other; called by *Ingraſſias* the great Wings of the Os Sphenoides, and they are ſometimes, though very rarely, ſeparated from the reſt of the Bone by tranſverſe Sutures: two orbitary Apophyſes, which form a conſiderable Portion of the Orbit, next the Temples: a ſmall ſharp Proceſs ſhaped like a Bird's Bill, in the middle ſpace between the two orbitary Apophyſes: two Pterygoide Apophyſes, each of which is divided into two Alæ, one external, which is the largeſt, the other internal, the lower end of which is in the ſhape of a Hook. Each Ala is again divided into two Sides, one external, towards the Temples, and one internal, towards the Palate: Two ſpinal Apophyſes: a little anterior Eminence above the ſharp Proceſs, for the Articulation of this Bone with the Os Ethmoides. In ſome Subjects, inſtead of this Eminence, there is a little Notch.

*Cavities on the outſide.*

233. The external Cavities are as follow: two Portions of the temporal Foſſæ: two Portions of the orbitary Foſſæ: two Pterygoide Foſſæ, the lower ends of which are divided by an irregular Notch or Slit, which may be termed Fiſſura Palatina: a little oblong Foſſula at the root of the internal Ala: two ſuperior orbitary or ſphenoidal Fiſſures: a little Notch at the end of each Fiſſure, for the paſſage of an Artery of the Dura Mater; two temporal Notches: two maxillary Notches, the Edges of which help to form the inferior orbitary Fiſſures, which I call Fiſſuræ Spheno-Maxillares; theſe Edges are likewiſe ſometimes conſiderably grooved: two Holes for the ſuperior Maxillary Nerves: two other Holes on one ſide of the former, called Pterygoide, which in an intire Skull are hid by other Bones: two oval Holes for the inferior Maxillary Nerves: two little round Holes, called ſpinal Holes, each of which tranſmits an Artery of the Dura Mater; ſometimes they are only Notches: another little Hole between the two Maxillary Holes: a little Groove on one ſide of the ſpinal Apophyſis, which forms part of the Euſtachian Tube.

*Eminences on the inſide.*

234. The internal Eminences are two thin ſharp tranſverſe Apophyſes, which form the ſuperior orbitary Fiſſures; called by *Ingraſſias* the little Wings of the ſphenoidal Bone: a little Proceſs in ſome Subjects, in the middle Space, between theſe thin Apophyſes, for the Articulation with the Os Ethmoides, which in other Subjects is a Notch: four clynoide Apophyſes, two anterior, and two poſterior; which laſt are ſometimes united in one, and ſometimes they run forward all the way to the anterior Proceſſes, forming a kind of Bridge, under which the internal carotide Artery paſſes at it's laſt Curvature; this Paſſage has likewiſe been found divided into two by a middle bony Septum, beſides many other Varieties: one or two ſmall Productions, where the internal Carotide enters the Cranium: two little ſtyloide Proceſſes

or Hooks, which in ſome Subjects join the Extremity of the Os Occipitis, before the perfect Union of theſe two Bones.

*Cavities on the inſide.* 235. The internal Cavities are two Portions of the large middle Foſſæ of the Baſis Cranii: two ſuperior orbitary or ſphenoidal Fiſſures: two optick Holes: a ſmall ſuperior orbitary Hole, near the end of each ſphenoidal Fiſſure, which is often no more than a Notch: a ſmall Groove at the Extremities of the ſame Fiſſures: A Depreſſion between the clynoide Apophyſes, called Sella Sphenoidalis, Sella Turcica and Foſſa Pituitaria. We ſee likewiſe almoſt all the Holes taken notice of in the outſide, and in particular, that the ſuperior Maxillary Hole ought more juſtly to be called a ſhort Canal.

236. Besides the Cavities hitherto mentioned, there are two very conſiderable ones, called the ſphenoidal Sinuſſes, ſituated in the thick Portion of this Bone, under the anterior part of the Sella Turcica and middle Space, between the two optick Holes, reaching as far as the ſharp Proceſs or Bill already deſcribed; they are commonly divided by a bony Septum, and they open before, on each ſide of the ſharp Proceſs, juſt behind the ſuperior Conchæ of the Noſe or Oſſa Convoluta ſuperiora. Their Figure, Size, Openings, and Septum vary conſiderably; ſometimes one of them is wanting, ſometimes one opens only into the other, ſometimes they are both wanting; ſometimes there are ſeveral Cells without any Septum, and ſometimes the Septum is placed more to one ſide than to the other.

*Subſtance.* 273 The Subſtance of this Bone is compact for the greateſt part, having very little Diploë, and what Diploë there is, lies in diſtinct parts of the Bone, *viz.* in the thick Portion behind the Sella Turcica towards the Symphyſis with the Occipital Bone, and in the Orbitary Apophyſes in a ſmall quantity.

*Situation in particular.* 238. To ſituate the Sphenoidal Bone aright, the Sella Turcica muſt be turned upward, the ſharp Proceſs forward, and the Pterygoide Apophyſes downward.

*Connexion.* 239. It is articulated with all the other Bones of the Cranium, with the Oſſa Malarum, Oſſa Maxillaria, Oſſa Palati and Vomer.

*Uſes.* 240. The Uſes have all been mentioned in the Courſe of the Deſcription.

## §. 6. *Os Ethmoides.*

*Situation in general.* 241. The Os Ethmoides is ſituated interiorly in the fore part of the Baſis Cranii.

*Figure.* 242. The Figure of the whole Bone taken together is very particular; it may be ſaid, however, in ſome meaſure to be Cubical.

*Diviſion.* 243. The Diviſions of this Bone are perfectly Arbitrary; that which I make choice of is into a middle and two lateral Portions; in the middle Portion I diſtinguiſh three parts, an upper, middle and lower.

244. The upper part of the middle Portion is an Eminence, called Criſta Galli, which is often ſolid; ſometimes, however, it has been found hollow in ſeveral degrees, and perforated by a ſmall Opening, which communicates

with the frontal Sinuſſes: A Groove is ſometimes met with in it's anterior Edge, which leads to the Spinal or blind Hole in the Os Frontis.

245. The middle part of this Portion is a ſmall horizontal Plate perforated by ſeveral Holes, called Lamina Cribroſa, and in the back part it has a little Notch for it's Articulation with the Sphenoidal Bone. This Lamina may be reckoned the Body of the Bone, as being what principally ſupports all the other parts thereof.

246. The lower part is a perpendicular Lamina which makes part of the Septum Narium. It's Edge is rough and uneven for it's better Connexion with the Vomer.

247. The lateral Portions of the Ethmoidal Bone are by far the moſt conſiderable, if we regard the ſize only. I divide each of them in two, one ſuperior, which is the largeſt, and which I term the Labyrinth of the Noſtrils, it being full of turnings and windings, and irregularly cellulous; and one inferior in the Shape of a Shell.

248. The Labyrinth has four ſides and two ends. The upper ſide is partly covered by the Cells of the frontal Sinus, and large Opening already deſcribed. The lower ſide is partly joined to the Cells of the Os Maxillare, and partly left expoſed and free; it ſends backward ſeveral Productions more or leſs conſiderable, which in Skeletons are often broken. Theſe Productions ſometimes join the Root of the ſharp Proceſs in the Sphenoidal Bone, being there fixed in lateral Grooves. The inſide is ſomething convex and rough; it is turned toward the Septum, and fixed only to the Edge of the Lamina Cribroſa. The outſide is flattened and very ſmooth, from whence it got the name of Os Planum; it makes part of the inſide of the Orbit, and at it's upper Edge there are often one or two ſmall Notches, parts of the internal Orbitary Holes already mentioned in the Deſcription of the Os Frontis.

249. The anterior Extremity of the Labyrinth is unequally cellulous; it is partly covered by the Cellulæ in the large Opening of the Os Frontis, and partly by the Os Unguis; and by a kind of Funnel it communicates with the frontal Sinus. The poſterior Extremity is covered partly by the Sphenoidal Bone, and partly by the Os Palati.

250. The inferior part of each lateral Portion reſembles in ſome meaſure an oblong Shell, ſuch as that of a Muſcle. I give it the name of Concha Narium ſuperior, or upper Shell of the Noſtrils. It is very rough and porous, it's convex ſide being towards the Septum, and the concave ſide towards the Os Maxillare. One end of it is turned backward, the other forward, and there the upper part of it joins the Labyrinth, by means of the Funnel already mentioned. This inferior part is diſtinguiſhed from the ſuperior or Labyrinth, by a remarkable lateral Groove.

*Situation in particular.*

251. What has been ſaid is ſufficient to direct us in ſituating this Bone, remembering only that the Head of the Criſta Galli ought to be turned forward.

*Subſtance.*

252. It is of a very delicate and tender Structure, though compact and without any Diploë, being almoſt all compoſed of very thin bony Plates.

253. It

*Connexion.*

253. It is joined to the Os Frontis, Os Sphenoides, Oſſa Naſi, Oſſa Maxillaria, Oſſa Unguis, Oſſa Palati and Vomer.

*Uſes.*

254. The Uſes of it are to be a principal part of the Organ of Smell, and to give a very great Extent to the pituitary Membrane in a ſmall compaſs, *&c.*

## §. 7. *Oſſa Temporum.*

*Number and Situation in general.*

255. The Oſſa Temporum are two in number, ſitua tedin the lower and lateral parts of the Skull.

*Figure.*

256. The Figure of each is partly ſemicircular reſembling the Scale of a Fiſh, partly like a ſhapeleſs Rock ending in ſeveral Points.

*Diviſion.*

257. Each of them is divided into two Portions, one ſuperior, termed ſquammous from it's Figure, the other inferior, called Apophyſis Petroſa or the Rock, not ſo much from it's Figure as from it's Hardneſs. This Portion is eaſily ſeparable from the former in Children, and ſome marks of this Diviſion ſtill remain in Adults, as *Riolan* has obſerved.

258. They are likewiſe divided into two Sides, one external and convex, the other internal and concave; and thus the Eminences and Cavities in them may likewiſe be divided into external and internal.

*External Eminence.*

259. The external Eminences are the Maſtoide Apophyſis in the lower and poſterior part of the Bone: The Zygomatic Apophyſis in the anterior Part: The Styloide Apophyſis under the Bone, which ſeems originally to have been an Epiphyſis. In one Subject I ſaw this Apophyſis three Inches in length, and in another, a Styloide Appendix joined to the ordinary Apophyſis by a Ligament, and ſtretched along the Stylo-Pharingæus Muſcle: The capſular Apophyſis in which the bony Stillet ſeems as it were to be ſet: The articular Eminence of the Zygomatic Apophyſis: The Lambdoidal Angle: the lower ſide of the Apophyſis Petroſa.

*External Cavities.*

260. The external Cavities are the articular Cavity immediately behind the Eminence ſo called, which both together ſerve for the Articulation of the lower Jaw: the Crack in the articular Cavities: the Maſtoide Notch or Groove in which the Digaſtric Muſcle is inſerted: the opening of the external Meatus Auditorius; the anterior indented Border of that Opening: the Stylo-Maſtoide or anterior Maſtoide Hole, which is the Orifice of the Paſſage of the Portio Dura of the auditory Nerve; *Falloppius* termed this Paſſage the Aqueduct, not becauſe of it's uſe, but becauſe of the reſemblance it bears to a kind of Aqueduct in his Country: the Orifice or inferior Hole of the carotide Canal in the Apophyſis Petroſa, which alters it's Direction upward and forward, and ends at the Point of the Rock near the Sella Sphenoidalis: a Portion of the jugular Foſſa, and a Portion of the Foramen Lacerum.

261. Among the external Cavities, we are likewiſe to reckon a Portion of the Ductus Palatinus of the Ear, called commonly Tuba Euſtachiana, and in *France*, the Aqueduct. This Duct, which muſt not be confounded with the Aqueduct of *Falloppius*, follows pretty much the Direction of the articular Crack: The Zygomatic Notch: The Parietal Notch, which receives the

poſterior and lower Angle of the Os Parietale: the ſphenoidal Notch, which receives the ſpinal Apophyſis of the Os Sphenoides; one or more little Sulci for the Ramifications of the temporal Artery: the Groove in the Apophyſis Petroſa, by which it is connected to the great Apophyſis of the Os Occipitis. We may likewiſe add the poſterior Maſtoide Hole, through which a ſmall Vein paſſes, that empties itſelf into the lateral Sinus: this Hole is ſometimes formed between this Bone and the Os Occipitis, ſometimes it is wanting in one of the Bones, and ſometimes in both. There is likewiſe in ſome Subjects a ſmall ſuperior Maſtoide Hole, which loſes itſelf in the Subſtance of the Bone.

*Internal Eminences and Cavities.*

262. In examining the internal Eminences and Cavities we muſt diſtinguiſh the ſquammous Portion from the Apophyſis Petroſa. In the former we ſee the radiated Indentations of the ſemicircular Edge, which, with the Parietal Bone, forms the ſquammous Suture: a Portion of the middle Foſſa of the Baſis Cranii on the ſame ſide, and ſeveral Inequalities in that Foſſa.

263. The Apophyſis Petroſa, or Rock, is a ſort of pyramidal Body with three Sides, ſituated obliquely, ſo as that it's Baſis turned backward and outward, and it's Apex forward and inward, toward the Sella Turcica. Of the three Sides, one is ſuperior and inclined a little forward; the ſecond poſterior, and the third inferior; this laſt belongs to the outſide of the whole Bone, which has been already deſcribed.

264. The upper Side aſſiſts in forming the middle Foſſa of the Baſis Cranii, being uneven in the ſame manner as the inſide of the ſquammous Portion. We obſerve here a ſmall irregular Hole appearing to be double, and partly covered by a ſmall bony Plate. This Hole is a kind of Break or Interruption in the Duct, through which the Portio Dura of the auditory Nerve paſſes.

265. In the backſide of the Rock we ſee the internal Auditory Hole, and a Portion of the Foſſa for the Cerebellum. Sometimes ſmall indeterminate Depreſſions are obſervable in it, pretty deep in Children but gradually obliterated as they advance in Years. At the Baſis of this Apophyſis we ſee a Portion of the Groove for the lateral Sinus, formed partly in this Baſis, and partly in the Lambdoidal Angle: alſo a Portion of the Foramen Lacerum; and a ſmall Point, which, as it were, divides this Hole in two, and diſtinguiſhes the paſſage of the jugular Vein, from that of the eighth Pair of Nerves.

266. As this Apophyſis has three Sides, ſo we may obſerve in it three Angles; the firſt ſuperior between the upper and back Sides, the ſecond poſterior, between the back and lower Sides, and the third anterior between the lower and fore Side. The ſuperior Angle, which is the moſt apparent, has a Groove for a ſmall Sinus of the Dura Mater; the poſterior Angle is in a manner interrupted near the middle by the Foramen Lacerum, and from it proceeds the little bony Point which divides this Hole. At the end of it is a Groove, by which it is connected with the great Apophyſis of the Os Occipitis. Between the Apex of the Apophyſis Petroſa and

the ſuperior Opening of the Carotide Canal, we often meet with a ſmall Bone of the ſeſamoidal kind, mentioned long ago by *Riolan.*

*Situation in particular.* 267. To ſet any one of the Oſſa Temporum in it's true ſituation, the Zygomatic Apophyſis muſt be placed horizontally and turned forward, and the Maſtoide Proceſs directly downward.

*Subſtance.* 268. ALMOST the whole Subſtance of the Oſſa Temporum is compact. The ſquammous Portion is thin and tranſparent. The Maſtoide Apophyſis is hollowed by conſiderable Cells. The Subſtance of the Apophyſis Petroſa is very hard and ſolid, with ſeveral internal Cavities for the Organ of Hearing contained in it.

*Connexion.* 269. EACH Os Temporis is joined above, to the Os Parietale, by a ſquammous Suture, behind and below, to the Occipital Bone, partly by a true Suture, and partly by Harmony; before, to the great Alæ of the Os Sphenoides, by a ſquammous Suture, and below to the ſpinal Apophyſes of that Bone. It is likewiſe joined before, to the Os Malæ by the Zygomatic Suture.

*Uſes.* 270. The chief Uſes of theſe Bones are to complete the Globe of the Skull, to ſerve for the Articulation of the lower Jaw, and for the Inſertion of many Muſcles, and laſtly to contain the Organ of Hearing.

*N. B.* THE Deſcription of the Bones of the Ear, and of the ſupernumerary Bones of the Skull, is placed immediately after that of all the other Bones of the Head.

### §. 8. *The Bones of the Face; and firſt, the Oſſa Maxillaria.*

271. I ſhall only add here, to what has been ſaid about theſe Bones in general in the Enumeration of the Parts of the Sceleton, that the Oſſa Palati, Vomer, Conchæ narium inferiores, and Oſſa Unguis, are very improperly ſaid to belong to the Face, except we chuſe to look upon them as concerned in the internal Structure of the Noſe, which is undoubtedly a part of the Face.

*Number and Situation of the Oſſa Maxillaria.* 272. THE Oſſa Maxillaria, or great Bones of the upper Jaw, are two in number, ſituated one on each ſide, in the anterior and middle part of the Face.

*Figure.* 273. THEIR Conformation is very irregular, and they are of a very conſiderable Extent.

*Diviſion.* 274. Each of them may be divided into two Sides, one external, the other internal. By the external Side, I mean all that appears in an intire Skull without taking in the Arch of the Palate; and by the internal Side, that which makes part of the Arch of the Palate, and all that is turned to the Septum Narium.

*External Eminences.* 275. THE external Eminences are the naſal Apophyſis, which makes the lateral Part of the Noſe: the orbitary Apophyſis, which makes the inferior Portion of the Cavity of the Orbit, and by a ſort of Criſta forms the internal Portion of its Edge; this Proceſs is likewiſe called Apophyſis Malaris, becauſe of its Connexion with the Os Malæ: the Apophyſis Palatina, which, together with that on the other ſide, forms the Arch of the Palate: the

Apophyſis Alveolaris, which is in the ſhape of an Arch, and contains the Teeth: the maxillary Tubercle, or the poſterior Extremity of the laſt named Arch: the Spine of the Nares, which is a ſmall pointed Eminence above the anterior Extremity of the Apophyſis Alveolaris.

*External Cavities.*

276. The external Cavities are theſe: a Portion of the orbitary Foſſa, where there is a ſmall Foſſula, in which the inferior oblique Muſcle of the Eye is inſerted, near the lachrymal Duct, and a Fiſſure or Crack, of which hereafter: a Portion of the Zygomatic Foſſa: a Portion of the Foſſa Palatina, or Arch of the Palate, in which many little Inequalities are obſervable, more or leſs pointed, and often little pointed Hooks.

277. Also the lachrymal Opening, which receives the Os Unguis: a ſmall lachrymal Groove, which together with the Os Unguis, forms the ſuperior Part of the lachrymal Duct: the Opening of the Nares: a Portion of the inferior orbitary Fiſſure, or Fiſſura Spheno-Maxillaris: the Opening which receives the Os Palati: a very ſmall Notch at the anterior Extremity of the Arch of the Palate, which forms the anterior Foramen Inciſorium, ſo called from it's Situation behind the Inciſors; an oblique Groove in the poſterior Part of the maxillary Tubercle, which contributes to the Formation of the poſterior Foramen Maxillare.

278. Also the orbitary Canal, which runs from before, backward, immediately under the inferior Portion of the Orbit: an anterior orbitary Hole, or the anterior Orifice of the orbitary Canal: the poſterior orbitary Hole, or the poſterior Orifice of the orbitary Canal, by which that Canal ends at the Edge of the Spheno-Maxillary Fiſſure: the Crack or Fiſſure of the orbitary Canal, which appears more or leſs in the Orbit, and is often a little open backward: the ſmall Holes of the maxillary Tubercle. The ſmall Holes near the orbitary Canal and thoſe of the Apophyſis Naſalis, vary and are ſometimes wanting. The Sockets ſhall be deſcribed hereafter.

*Internal Eminences and Cavities.*

279. The internal Eminences and Cavities are as follow: the greateſt Part of the Foſſa Naſalis: the anterior Criſta of the Nares, which is high and narrow; the poſterior Criſta of the Nares, which is low and broad. Theſe two Criſtæ are a Continuation of the Spine of the Nares, N°. 275. and are ſo diſpoſed as to form a long Groove for the Reception of the Septum Narium, when the two maxillary Bones are joined together: a perpendicular and pretty hollow Groove, wide towards the upper part, narrow towards the lower, which makes the inferior Portion of the lachrymal Duct.

280. Also the anterior Ductus Palatinus on one ſide of the anterior Criſta, and near the Spine of the Nares; this Duct, in it's Courſe downwards, joins that of the other Jaw, and both together form the anterior Foramen Palatinum, or Inciſorium, which is often very complex: a ſmall anterior Eminence or tranſverſe Line, between the naſal Opening, and the lower end of the lachrymal Duct, which ſuſtains the fore Part of the Concha Narium inferior: a rough broad impreſſion on the maxillary Tubercle, on both ſides of the Paſſage of the Foramen Palatinum, by which this Bone is joned with the Os Palati: a ſmall poſterior Eminence or tranſverſe Line, covered with a Lamina of the Os Palati, which ſuſtains the Inequalities of the poſterior

End of the Concha Narium inferior, by the intervention of a Lamina of the Os Palati, as we ſhall ſee afterwards.

281. LASTLY, the maxillary Sinus, which is a large Cavity under the Orbit, in the orbitary Apophyſis. It extends to the Suture of the Os Malæ, to the Spheno-Maxillary Fiſſure, to the inferior orbitary Hole, and below to the Sockets. Towards it's upper Edge, there are ſometimes Cells, which communicate with the Os Ethmoides. It opens between the two Conchæ Narium, behind the lachrymal Duct, by one or more Orifices, formed partly by a Portion of the Os Palati, partly by a Portion of the Concha Narium inferior, and ſometimes partly by a Portion of the Os Unguis. Theſe Openings are all much higher than the bottom of the Sinus.

282. I ſay nothing here of the Separation of this Bone by a ſmall tranſverſe Suture, behind the Foramen Inciſorium, becauſe it is ſeldom found but in young Subjects before the Oſſification is completed.

*Subſtance.* 283. THE maxillary Bone is almoſt all compact, and without Diploë, except in the alveolary Arch, and at the Point of the orbitary Apophyſis.

*Situation in particular.* 284. To put this Bone in it's true Situation, the naſal Apophyſis muſt be turned upwards, the alveolary Arch downward, and the Spine of the Nares forward.

*Connexion.* 285. THE maxillary Bones are connected with the Os Frontis, Os Ethmoides, Os Sphenoides, Oſſa Unguis, Oſſa Malarum, Oſſa Naſi, Oſſa Palati, Vomer, Conchæ Narium inferiores, and with each other.

*Uſes.* 286. THEY aſſiſt in forming the Organ of Maſtication, the Arch of the Palate, the Cheeks, the Orbits, the Noſe, *&c.*

## §. 9. *Oſſa Malarum.*

*Number and Situation in general.* 287. THE Oſſa Malarum, called alſo Oſſa Zygomatica, and Malaria, are two in number, ſituated in the lateral and middle Parts of the Face.

*Figure.* 288. THEY are in ſome meaſure triangular, or irregularly ſquare.

*Diviſion.* 289. THEY are divided into two ſides, the external gently convex, the internal unequally concave.

*Eminences.* 290. THE Eminences in each Bone are the ſuperior or angular orbitary Apophyſis, which joins by Suture with the external angular Apophyſis of the Os Frontis, and aſſiſts in forming the external Angle of the Orbit: from this Apophyſis another ſubaltern Proceſs runs inward on the inſide of the Bone, one ſide of which forms a Portion of the Orbit, the other, a Portion of the Zygomatic Foſſa: the inferior or maxillary orbitary Apophyſis, which, with the angular Apophyſis, forms the inferior external Portion of the Orbit: the Apophyſis Malaris, which is in ſome meaſure the Baſis of the reſt, and together with the Apophyſis Maxillaris joins the orbitary Apophyſis of the Os Maxillare: the Zygomatic Apophyſis, which makes a part of the Zygoma, and alſo of the Zygomatic Foſſa.

*Cavities.* 291. THE Cavities are the great orbitary Slope, which makes the inferior external Portion of the Edge of the Orbit: the Zygomatic Notch above the

Zygoma: one or more little Holes on the outſide and in the orbitary Apophyſes.

292. Each Bone is compoſed of two pretty compact Tables, with a ſmall Quantity of Diploë between them, except in the anterior part of the Apophyſis Malaris. *Subſtance.*

293. The true Situation will be eaſily fixed, by conſidering what has been ſaid about the Sides and Apophyſes of this Bone. *Situation in particular.*

294. The Os Malæ on each ſide is joined to the Os Frontis by the angular Apophyſis, to the Os Sphenoides by the ſubaltern Apophyſis, to the Os Temporis by the Zygomatic Apophyſis, and to the Os Maxillare by it's Baſis. *Connexion.*

295. These Bones make the prominent upper Part of the Cheeks, moſt remarkable in lean Perſons. They form likewiſe a Portion of the Orbit, and complete the Zygomatic Arches. *Uſes.*

### §. 10. *Oſſa Naſi.*

296. The proper Bones of the Noſe are two in Number, joined together, and ſituated below the Forehead, between the two naſal Apophyſes of the Oſſa Maxillaria. *Number and Situation.*

297. Each of theſe Bones comes near the Figure of an oblong Square, the upper Extremity being narrow and thick, the lower oblique and thin; the middle Part bent inwards near the upper End in ſome Subjects, in others almoſt ſtrait. The two Bones joined repreſent a ſort of Saddle, *Figure.*

298. Each of them is divided into two Sides, one anterior or external, the other poſterior or internal; two Extremities, one upper, the other lower; and two Edges, one external, the other internal. *Diviſion.*

299. The anterior Side is convex, though a little depreſſed or hollowed above the middle. The poſterior ſide is gently concave The upper Extremity is very thick, full of Points and Depreſſions. The lower Extremity is thin, unequally indented, and cut obliquely in ſuch a manner, as that the two Bones, joined together, form an acute ſlope. The inner Edge, contiguous to the ſame Edge of the other Bone, is even, except near the upper Part, where they are united by a kind of Suture. From this Edge, a little Eminence runs inward or backward (which is ſometimes wanting in one of the Bones;) and when they are joined, theſe Eminences repreſent a ſort of Criſta or prominent Line, anſwering to the Septum Narium. About the middle of the outſide, ſometimes higher, ſometimes lower, there is a Hole, which is ſometimes wanting in one of the Bones, and ſometimes there are ſeveral Holes in each.

300. The Subſtance is compact, ſometimes however we meet with a ſmall Quantity of Diploë at the upper end. *Subſtance.*

301. The particular Situation of theſs Bones is eaſily underſtood by the Deſcription. *Situation in particular.*

302. They are joined to each other, partly by Suture, and partly by Harmony. They are joined above to the naſal Apophyſis of the Os Frontis, laterally *Connexion.*

laterally to the naſal Apophyſes of the Oſſa Maxillaria, and interiorly or poſteriorly to the anterior Edge of the perpendicular Lamina of the Os Ethmoides, by means of the prominent Line already mentioned.

*Uſes.* 303. They form the anterior and upper Portion of the Noſe, and part of the Septum Narium.

## §. 11. *Oſſa Unguis.*

*Number, Situation and Size.* 304. The Oſſa Unguis or Lachrymalia are two in number, each being ſituated in the Orbit, at the lower part of the internal Angle. They are the leaſt Bones of the Face, very thin and tranſparent.

*Figure.* 305. They are longer than they are broad, reſembling in ſome meaſure the Nail of a Finger, (from whence they have their name) eſpecially when in Situ; for being taken out of the Skull, their Figure is more irregular.

*Diviſion.* 306. Each of them is divided into two Sides, one external, the greateſt part of which appears in the Orbit, in an intire Skull, the other internal, which is hid; two Extremities, one upper, the other lower, and two Edges, one anterior, the other poſterior.

307. The outſide is ſmooth, and a little concave. Towards the anterior Edge is a Groove full of ſmall Holes, like a Sieve, called the lachrymal Groove. It begins at the upper Extremity, and runs down lower than any other part of this ſide of the Bone, the lower Extremity of it being hid by the Os Maxillare. It is diſtinguiſhed from the reſt of the outſide, by a very ſharp prominent Edge.

308. The inſide is rough and unequally convex, with a perpendicular Depreſſion, anſwering to the ſharp Prominence on the outſide. On the upper part of this inſide, ſmall Portions of cellulous Laminæ are ſometimes obſervable, which communicate with the entry of the frontal Sinus. There are likewiſe ſome about the middle, which complete the anterior Ethmoidal Cells; and others towards the lower end, which communicate with the rugged Portions of the upper Border of the Sinus Maxillaris. Theſe often vary, and are ſometimes wanting.

*Subſtance.* 309. These Bones are altogether without Diploë.

*Situation in particular.* 310. What has been ſaid about the two Sides and lachrymal Groove, ſufficiently determines the Situation.

*Connexion.* 311. They are connected with the Os Frontis, with the Os Ethmoides, covering a part of the Cells in that Bone, with the naſal Apophyſis of the Os Maxillare, and with the Groove of that Bone, in ſuch a manner, as that the two Grooves joined together form an intire Tube, called the lachrymal Duct. They alſo cover a little the Opening of the Maxillary Sinuſſes, and join the inferior Conchæ of the Nares, of which they appear to be only a Continuation, in an advanced Age.

*Uſes.* 312. The Uſes of them are to complete the internal Sides of the Orbit, to cover the forepart of the Labyrinth of the Noſe, and to form the lachrymal Duct.

## §. 12. *Oſſa Palati.*

313. The Bones of the Palate are two, ſituated in the poſterior part of the Arch of the Palate, between the Pterygoide Apophyſes, and the Oſſa Maxillaria, and running up on the Sides of the naſal Foſſæ, all the way to the bottom of each Orbit. *Number and Situation in general.*

314. The Figure of theſe Bones is not ſquare, as is ſaid by thoſe who have only ſeen that Portion of them which belongs to the Palate, and from thence have named them Oſſa Palati. The intire Bone is crooked, hooked, pointed, and uneven, though but of a ſmall ſize. *Figure.*

315. Each of them may be divided into four Portions, one ſuperior, one middle, and two lower; whereof, one is anterior, the other poſterior. *Diviſion.*

316. The lower and anterior Portion, which I call Portio Palatina, is the Baſis or Body of the Bone, and the only part of it which the ancient Anatomiſts have obſerved, *Vidus Vidius* excepted. It completes the Arch of the Palate, and the Bottom of the naſal Foſſa. The inner Edge of it is raiſed, and that joined to the like Edge of the other Bone, forms a Groove, which receives part of the Septum Narium, in the ſame manner as the other part of it is received in a like Groove of the Oſſa Maxillaria. The poſterior Edge is gently ſloped, and ends inwardly in a Point which joins a like Point in the other Bone.

317. The lower and poſterior Portion, which I name Pterygoide, is pointed and hollowed on each ſide, to join the Pterygoide Apophyſis, of which it completes the Foſſa, being fixed like a Wedge in the irregular Notch of that Proceſs. Exteriorly it is uneven, the better to be connected with the Os Maxillare. This Portion is diſtinguiſhed from the Portio Palatina, and alſo from the middle Portion, by an oblique Half-Canal which, with the Half-Canal in the maxillary Tubercle, forms an intire Canal, the lower end of which is the poſterior Foramen Palatinum.

318. The middle Portion, to which I give the name of Naſal, is very thin, and is ſituated laterally. It has an internal and external Side. The internal Side is a little concave, being turned toward the Nares, and at the lower part of it there is a tranſverſe Eminence or bony Line which diſtinguiſhes this Portion from the Portio Palatina. The outſide is a little convex, and partly covers the Opening of the maxillary Sinus. At the lower part of it is a tranſverſe Groove, anſwering to the Eminence on the other ſide, and moulded, as it were, by the poſterior tranſverſe Eminence of the Os Maxillare.

319. The upper Portion, which I call orbitary, is diſtinguiſhed from the naſal Portion, by a Notch, which, together with the Pterygoide Apophyſis of the Sphenoidal Bone, forms an Opening more or leſs conſiderable, which may be called Foramen Spheno-Palatinum or Pterygo-Palatinum. This Portion has five little Sides, three of which are rather Cavities; one ſuperior, which completes the Extremity of the Bottom of the Orbit, and is more or

leſs flat, very ſmall, ſmooth and triangular; one anterior, which is a little hollow, covering the upper part of the maxillary Tubercle, and by a ſmooth rais'd Edge completing the Fiſſura Spheno-Maxillaris; the third Side is likewiſe anterior, more hollow than the former, joining the back part of the Labyrinth of the Os Ethmoides: The fourth is poſterior, more or leſs hollow, anſwering to the Sphenoidal Sinus: the fifth is lateral and external, covering the poſterior and upper part of the Maxillary Sinus. It muſt be obſerved, that theſe Sides and Cavities vary, being ſometimes ſingle, ſometimes complex.

*Subſtance.* 320. THERE is very little Diploë in theſe Bones, except in the Palatin and Pterygoide Portions.

*Situation in particular.* 321. BY conſidering the Diviſion of theſe Bones already mentioned, it is eaſy to put them in their true Situation.

*Connexion.* 322. THEY are joined to each other by the Portio Palatina, to the Vomer by the common Groove formed by their raiſed Edges, to the Maxillary Bones before, and laterally, to the Sphenoidal Bone behind, to the inferior Shells of the Nares, by their tranſverſe Eminence; and laſtly, by their Orbitary Portions to the Os Ethmoides, Oſſa Maxillaria, and Os Sphenoides.

*Uſe.* 323. THEY compleat the Arch of the Palate, the Pterygoide and Naſal Foſſæ, and the Orbit; they aſſiſt in ſupporting the Vomer and Conchæ Narium inferiores.

## §. 13. *Vomer.*

*Situation in general.* 324. THE Situation of the Vomer is perpendicular between the two Naſal Foſſæ backward.

*Figure.* 325. THE Figure of it is nearly that of an oblique Square, having ſome reſemblance to a Ploughſhare, from which it has it's Name.

*Diviſion.* 326. IT is divided into two ſides, one to the right, the other to the left, both of them unequally flat; and into four Edges, the ſuperior, inferior, anterior, and poſterior.

327. THE upper Edge is an horizontal Groove which receives the ſharp Proceſs or Roſtrum of the Os Sphenoides. This Groove is broad and a little notched backward; the fore part of it is narrower, and ends in a ſtrait Canal, which runs downward and forward in an oblique direction, dividing the Bone, as it were, into two Laminæ.

328. THE anterior Edge is oblique and very unequal. It may be divided into two parts, one anterior, the other poſterior. The poſterior part is ſmall and thin, and ſupports the perpendicular Lamina of the Os Ethmoides. The anterior part is larger, with a pretty deep Groove, continued from the Canal in the upper Edge, which ſuſtains the Cartilaginous Septum of the Nares.

329. THE lower Edge is likewiſe unequal, and near it's anterior Extremity is an Angle which divides it into two parts; one anterior very ſhort, which is ſet in the Criſta Narium; the other poſterior and much

longer, ſet in the common Groove of the Oſſa Maxillaria and Palati. The Angle by which this Edge is divided lies in the Notch formed by the Criſta Narium and the Groove of the Maxillary Bones.

330. The poſterior Edge is oblique and ſharp, becoming inſenſibly more obtuſe as it approaches to the large Groove in the Edge.

331. This Bone has but very little Diploë. *Subſtance.*

332. To ſituate it right, we need only attend to the Deſcription of it's parts. *Situation in particular.*

333. It is connected with the Os Sphenoides, Os Ethmoides, Oſſa Maxillaria, and Oſſa Palati in the manner already ſaid. *Connexion.*

334. Its Uſe is to form the poſterior part of the Septum Narium. *Uſe.*

### §. 14. *Conchæ Narium Inferiores.*

335. The inferior Shells of the Nares are two in number, ſituated in the Naſal Foſſa, under the Openings of the Maxillary Sinus, and immediately above the inferior Orifices of the Lachrymal Ducts. They cover theſe Orifices much in the ſame manner as the ſuperior Conchæ of the Ethmoidal Bone cover the Maxillary Openings. They are likewiſe termed the inferior ſpungy Laminæ of the Noſe. *Number and Situation in general.*

336. Their Figure is very much like that of the ſuperior Shells. *Figure.*

337. Two Sides are diſtinguiſhable in each of them, one internal, and one external; as likewiſe two Extremities, the anterior and poſterior; three Edges, two ſuperior, one ſmall, the other great, and one inferior; and laſtly, two Apophyſes, one ſmall or ſuperior, the other large or lateral. *Diviſion.*

338. The inſide is gently convex, being turned towards the Septum Narium; the outſide is proportionably concave, turned towards the Maxillary Sinus. Both Sides are rough and uneven.

339. The Extremities are pointed, but the poſterior more than the anterior

340. The inferior Edge, the moſt conſiderable of the three, is rough, thick, a little rounded and turned outward, that is, toward the Os Maxillare. It is ſuſpended like the Ethmoidal Concha, without reſting on any thing.

341. The ſmall or anterior upper Edge is thin, uneven, and of the ſame length with the anterior tranſverſe Eminence of the Os Maxillare to which it is joined. The large or poſterior upper Edge is longer than the other, and is joined backward to the ſmall tranſverſe Eminence of the middle Portion of the Os Palati. Theſe two ſuperior Edges are diſtinguiſhed by an obtuſe Angle formed by them. The great Edge has a large thin Apophyſis in ſhape of a Nail, which runs down on the inner or concave ſide of the Bone. This Apophyſis, which is the greateſt of the two already mentioned, is ſometimes ſmooth, ſometimes uneven, divided and notched. It partly covers the Maxillary Sinus, and helps to make the Opening thereof.

342. The ſmall or ſuperior Apophyſis, is a thin Plate, which divides the two upper Edges. It is, as it were, a ſmall Portion of a Groove which joined to the lower end of that in the Os Unguis, completes the Lachrymal Canal, and in Adults it has appeared to be a true Continuation of the laſt named Bone, as if the inferior Concha of the Nares and Os Unguis were both one piece.

*Situation in particular.* 343. The true ſituation of theſe Bones is ſufficiently ſhewn in what has been ſaid about their Sides, Extremities and Edges.

*Connexion.* 344. They are connected with the Oſſa Maxillaria, Oſſa Palati, Oſſa Unguis, and ſometimes with the Os Ethmoides, of which they appeared in one ſubject to be a true continuation. In moſt Sceletons, theſe Connexions are but very ſlender, and therefore theſe Bones are eaſily loſt, which is the reaſon why the Ancients have not obſerved them.

*Uſes.* 345. They complete the bony Structure of the Noſe, augment it's Surface, and render it proportionable to the extent of the Organ of Smell, and of the Pituitary Membrane.

### §. 15. *Maxilla Inferior.*

*Situation in general.* 346. The lower Jaw is but one Bone in Adults, and makes the lower part of the Face, being ſituated there.

*Figure.* 347. It bears ſome reſemblance to a Bow, with the ends bent upward.

*Diviſion.* 348. It may be divided into a Body and Branches. The Body is that Portion which repreſents a Bow; the Branches are the Extremities bent upward. In the Body, we diſtinguiſh an anterior Portion, called the Chin; two lateral Portions; two Sides, one internal, and one external; and two Edges, one ſuperior, which is the alveolary Arch of this Jaw, and one inferior, called the Baſis, and divided into an external and internal Labium. This Baſis ends poſteriorly in a crooked Portion, termed the Angle of the lower Jaw.

349. In the middle of the anterior Side of the Chin is a perpendicular Eminence or Line which marks the place where this Bone is divided in Children, and, for that reaſon, named the Symphyſis of the lower Jaw. On each ſide of the Symphyſis are two muſcular Impreſſions, one high, the other low, more or leſs excavated, and in ſome Subjects diſtinguiſhed by a ſmall tranſverſe Eminence. The external Labium of the Baſis of the Chin is a little prominent, and bordered on each ſide by Eminences more or leſs conſiderable, by which the Chin appears to be diſtinguiſhed from the lateral parts of the Body of the Bone.

350. The backſide of the Chin is concave, and Inequalities are ſeen in it, through the whole length of the Symphyſis. From the upper Edge, to the middle of the Symphyſis, or thereabouts, runs a ſuperficial Aſperity, broader below than above, and more remarkable in the Symphyſis, than on either ſide. Immediately below this Aſperity, there are ſeveral Tuberoſities more or leſs raiſed and rough, the loweſt of which is on the internal Labium of the Baſis. On each ſide of the uppermoſt Tuberoſity is a large ſhallow Impreſſion.

At the very loweſt Border of the internal Labium of the Baſis, on each ſide of the Symphyſis, there is a pretty large muſcular Impreſſion, with a tranſverſe Aſperity between them, which in a manner joins them to each other. We ſometimes meet with ſmall Holes in the upper part of the Symphyſis, and near it.

351. The outſide of each lateral Portion of the Body of the Bone is a little convex. On each ſide of the Chin is a pretty large Hole, which is the anterior Orifice of a Canal hereafter to be deſcribed. There is alſo a long Eminence or Elevation, which beginning at the Baſis, near the forementioned Hole, runs obliquely upward and backward toward the Branch of the Jaw, growing more prominent as it aſcends. The lower Edge of this Side ſometimes juts out a little.

352. In the inſide of this lateral Portion, a little below the alveolary Edge, there is likewiſe a long Eminence, leſs oblique, but more prominent, which runs upward and backward, much in the ſame manner with that on the outſide.

353. The poſterior Curve Portions are the flatteſt of all, and repreſent a ſort of oblong ſquare, irregular, and a little oblique. In each of theſe Branches two Sides are to be taken notice of, one internal and one external; alſo two Apophyſes, in the upper part of them, one anterior called the Coronoide Apophyſis, and one poſterior called the Condyloide Apophyſis; a large Opening between the two Apophyſes; and laſtly, an Angle by which the poſterior and lower part or Baſis of the Branch is terminated.

354. The anterior or Coronoide Apophyſis is flat, ſharp at the upper End, broad at the lower, ſomething uneven on the outſide, and a little prominent about the middle of the inſide, by the Continuation of the internal oblong Eminence of the lateral Portion. The anterior Edge of this Apophyſis is a Continuation of the oblique external Eminence of the ſame Portion.

355. The poſterior Apophyſis is termed Condyloide, becauſe it ends in a Head reſembling a Condyle, ſet upon a kind of Neck. This Condyle is oblong, and ſituated almoſt tranſverſely, the internal Extremity of it being only turned a little backward, and the external forward, which Direction anſwers to that of the articular Eminence and Cavity of the Os Temporis, with which this Condyle is articulated. It advances more toward the inſide than toward the outſide of the Bone, and the Neck is bent a little forward. This Neck is convex on the back part, and on the fore part there is a muſcular Foſſula immediately under the Condyle.

356. The great Opening between the Apophyſes has a ſharp Border, which is, as it were, a Continuation of the poſterior Edge of the Coronoide Apophyſis. It is in the ſhape of a Creſcent, and ends at the outer Extremity of the Condyle on the outſide of the Foſſula in it's Neck.

357. The outſide of the Branch is very full of ſuperficial Inequalities or muſcular Impreſſions, eſpecially near the Angle. This Angle is blunt, uneven, and turned more or leſs toward the outſide.

358. The inſide has the ſame ſort of Inequalities towards the Angle. About the middle of this ſide is a very irregular Hole, being the internal Orifice of a large Canal, which, after having run down a little way in the middle Subſtance of the Branch, changes it's Direction, continuing it's Courſe through the middle of the lateral Portion, all the way to the Hole near the Chin, which is its external Orifice, and then loſes itſelf in the Subſtance of the Chin. The internal Orifice of this Canal is broad above, oblique, flat, more or leſs notched, and in ſome meaſure lacerated. A little below this Orifice are ſometimes found two little Holes, one above, and at ſome diſtance from the other; which are the Orifices of a very ſmall Canal running immediately under the Surface of the Bone. This Canal is the Continuation of a ſmall Groove, which begins at the Edge of the Orifice of the great Canal, and from thence runs a very little way down. In ſome Subjects we find only the Groove without any Canal.

359. The upper Edge of the Body of the lower Jaw is pierced by ſixteen Holes and Foſſulæ, called Sockets, which contain the like number of Bones, called Teeth, both which I ſhall deſcribe together.

*Subſtance.*

360. This Bone appears to have a larger ſhare of Diploë in proportion to it's Size, than any other Bone of the Face, eſpecially near the alveolary Arch. The Tables are very ſolid, and not equally thick in all Parts.

*Situation in particular.*

361. There is no difficulty in determining the Situation of the lower Jaw.

*Connexion.*

362. The lower Jaw is connected with the Oſſa Temporum by a very ſingular kind of Articulation, partaking of the Nature both of a Ginglymus and Arthrodia, and therefore I term it Amphidiarthroſis. It's principal Motions are upward and downward, and in all the different Degrees thereof we can thruſt it forward, pull it backward, and turn it to either ſide; and in the ſame manner, in any Degree of Motion forward, backward, or laterally we can raiſe or depreſs it. The Mechaniſm of this Articulation, and the Motions thereof depend alſo on a Cartilage, which not being found in the Sceleton, the Deſcription of it muſt be referred to that of the freſh Bones.

## §. 16. *Dentes.*

363. The Teeth are the hardeſt, moſt ſolid, and whiteſt parts of the whole Sceleton.

*Number, Situation in general and Figure.*

364. In an adult Perſon, they are generally thirty-two in Number, ſixteen placed in the lower Edge of the upper Jaw, and ſixteen in the upper Edge of the lower Jaw. They are all fixed in their Sockets, like ſo many little Wedges or Stakes, the Heads and Points of which are different from each other.

*Diviſion and Situation in particular.*

365. The Teeth in each Jaw are divided into three Claſſes; the firſt including the four anterior Teeth, called Inciſores; the ſecond, including the two next, one on each ſide, named Canini; and the third including the other ten, five on each ſide, named Molares.

366. In each Tooth we diſtinguiſh two Portions, one without the Socket, called the Body of the Tooth, and in the Dentes Molares, the Crown; the other within the Socket, called the Root of the Tooth. Theſe two Portions are divided by a kind of circular Line, which may be termed the Collar of the Tooth. When the Teeth are in Situ, the Roots of the ſuperior Row are turned upward, the Bodies downward; in the lower Row, the Roots are turned downward, and the Bodies upward.

367. The Inciſors are ſo called from a *Latin* Word, which ſignifies, to cut or divide. They were likewiſe called formerly Dentes Riſorii, becauſe they appear in laughing. The four upper Inciſors are larger and broader than the four lower; and of the upper, the two in the middle are larger than the other two.

*Dentes Inciſores.*

368. The Bodies of theſe Teeth reſemble ſharp cutting Wedges, and their Roots, pointed Wedges. The Bodies are ſo diſpoſed, as that their ſharp Edges lie all in a Line, making one uniform Edge. Each Body has four Sides, one anterior, a little Convex; one poſterior, a little Concave; and two lateral, much narrower than the former, and almoſt flat. The anterior and poſterior Sides decreaſe in breadth towards the Collar, the lateral Sides, towards the Edge; ſo that they repreſent in ſome meaſure four Triangles with their Apices and Baſes reciprocally oppoſite.

369. These Teeth have long Roots; their lateral Sides are broad and flat, the anterior and poſterior Sides, narrow, and they terminate by degrees in a Point, in which a ſmall Hole is obſervable, pretty conſiderable in Children, but obliterated in old Age.

370. The Dentes Canini are ſo termed, becauſe they are naturally a little pointed, and appear longer than the reſt, almoſt in the ſame manner as in Dogs. They might likewiſe be called Angular, becauſe they make a ſort of Angle by which the Inciſors are ſeparated from the Grinders. The two ſuperior have alſo been named Eye-Teeth from their Situation.

*Dentes Canini.*

371. The Bodies of them are thicker and more prominent than the Inciſors, convex and a little rounded on the outſide, and ending in a ſhort triangular Point, one of the Sides of which is a continuation of the Convexity of the outſide, the other two are flatter and turned inwards. Theſe Points are often worn out by Maſtification. Their Roots are commonly larger, thicker, longer, and more pointed, than thoſe of the Inciſors, and ſometimes perforate the bottom of the Maxillary Sinus.

372. The Dentes Molares are ſo called, becauſe they ſerve as ſo many Mills to grind the Food. They are generally twenty in number, five placed on each ſide of both Jaws; immediately after the Canini. The two firſt in each row are ſmall, the two next larger; as is alſo the laſt, which appears very late, and is often wanting; and from thence the Molares have been diſtinguiſhed into ſmall Grinders, large Grinders and Dentes Sapientiæ, becauſe they ſeldom appear till Men arrive at the years of Diſcretion.

*Dentes Molares.*

373. Their Bodies in general are ſhort, very thick, irregularly Cylindrical, or rather, with four ſides a little rounded, and terminated by a broad end more or leſs filled with obtuſe Points cut, in ſome meaſure, like

ſo many Diamonds. The name of Crown is moſt frequently given to the Bodies of theſe Teeth, the reſemblance being greater than in the others.

374. In the two ſmall Molares, the Crown is leſs than in the others, and often not ſo large as the Bodies of the Canini: they have commonly but two Points; though ſometimes the ſecond appears to have three. In the two large Molares, the Crown has a much greater extent, and the Points are three, four, or five in number. The fifth Grinder or Dens Sapientiæ has a Crown much like the two former, but often more rounded and with fewer Points.

375. The Roots of the Molares are long and more or leſs flat; ſingle in ſome of them, in others, two, three, four, but rarely five in number. Sometimes all theſe Roots are diſtinct, ſometimes wholly united, and ſometimes united only in part. They are generally ſtrait, and at a greater diſtance from each other at their Extremities, than at the Crown of the Tooth.

376. The Roots of the ſmall Grinders appear often ſingle without being ſo in reality; for in examining them narrowly, we find they have two Roots united, or, as it were, ſodered together. Sometimes all the diſtinction that appears is in two ſeparate Points.

377. The great Molares have commonly ſeveral Roots; the firſt three, and the ſecond four; or the firſt four, and the ſecond ſometimes five; but theſe numbers are variable. Theſe Roots are ſometimes all perfectly diſtinct; ſometimes they are partly diſtinct and partly united in the ſame Tooth, in different degrees. In ſome Subjects, one or more of their Points are bent outward, inward, or in other Directions; and we do not always meet with more Roots in the upper Teeth than in the lower.

378. The fifth Grinder has often but one Root, ſometimes very ſhort, and ſometimes very long. We meet with this Tooth even in grown Perſons almoſt wholly hid in it's Socket, which has then but a very ſmall opening. Laſtly, it ought to be remarked concerning all the Molares, that near the Collar, their Roots unite in a ſort of Trunk.

*Subſtance.* 379. In an adult Perſon, the Teeth in general are very compact and ſolid. A very narrow Cavity goes from the Body to the point of the Root, where it ends in a ſmall Hole, which at length becomes imperceptible, and even quite diſappears. But to be more particular, the outer Subſtance of the Teeth is different from the inner; and that of the Body, from that of the Root.

380. The Bodies of the Teeth are cruſted over with a Subſtance much harder than the reſt, naturally very white, poliſhed, and ſhining, looking like the imperfect Vitrification of China-ware or like Enameling: and nothing can deſtroy it but the File or Corroſive Liquors. It may be called the Enamel of the Teeth. The Roots have ſome ſmall ſhare of it, but not near ſo much as the Bodies.

381. When viewed through a Microſcope, this Subſtance appears to be made up of ſhort Fibres, the radiated Extremities of which are turned both inwards and outwards. The inner Subſtance of the Teeth is the ſame with

that of the other Bones, only harder than any of them except the Apophyſis Petroſa of the Os Temporis.

382. The Teeth are connected with the Sockets in both Jaws by an Articulation without Motion, called Gomphoſis. They are fixed in the Sockets like Pins or Nails, their Roots being exactly ſurrounded by the ſpungy Subſtance or Diploë, and appearing like Moulds for the Cavities of the Sockets, which are rather porous Vaginæ than ſpungy Foſſulæ. The Trunk of the Root is ſurrounded by the common Orifice of the Socket at a ſmall diſtance from the circular Line or Collar. The upper and lower Teeth meet in ſuch a manner as that the firſt, and eſpecially the Inciſors, advance moſt forward and run over the latter, the Arch of the lower Teeth appearing to be ſmaller than that of the upper. *Connexion.*

383. In general, the Teeth ſerve for Maſtication or Chewing. In particular, the Inciſores tear and cut the Food; the Canini break it to pieces, and the Molares bruiſe and grind it. The Teeth, eſpecially the Inciſors, contribute likewiſe to the Articulation of Sounds. *Uſes.*

## §. 17. *Os Hyoides.*

384. The Os Hyoides, or Bone of the Tongue, is ſituated in the middle Space between the Angles of the lower Jaw. It is a little Bone, and reſembles in ſome meaſure the Baſis of the lower Jaw, or a ſmall Bow. The ancient *Greeks* compared it to one of the Vowels in their Language, and from thence came the name of Os Hyoides, Yoides, or Ypſiloides. *Situation in general and Figure.*

385. It is diſtinguiſhed into the Baſis which is the anterior part; two large Cornua which are the lateral parts, and two ſmall Cornua or Appendices which are the ſuperior parts, to the upper end of which, other Appendices are frequently joined. *Diviſion.*

386. The Baſis is the broadeſt and thickeſt part. It is ſituated tranſverſely, and two Sides may be diſtinguiſhed in it, one anterior unequally convex, and one poſterior unequally concave; it has likewiſe two Edges, one ſuperior, and one inferior; and two Extremities, one to the right, and one to the left. The Angles of it might likewiſe be diſtinguiſhed.

387. In the middle of the Fore-ſide is a particular Eminence, which divides it into right and left Portions, and which terminates above in a ſmall pointed Tubercle, with a ſmall hollow Impreſſion on each ſide. At the lower end of this Eminence there are alſo two ſuch Impreſſions, but much larger. Near each Extremity we find Inequalities which end in the Angles of the Baſis. The Backſide, as has been already ſaid, is hollow.

388. The large Cornua are joined to the Extremities of the Baſis by Cartilaginous Symphyſes; which in Adults become long. In each Cornu we diſtinguiſh the Root or anterior Extremity, the point or poſterior Extremity, and the middle Portion. The length of each Cornu is near double that of the Baſis. The Roots are thick and broad, and by them the Cornua are joined to the Baſis. The lower part of the middle Portion is a little crooked and alſo broader than the reſt. The Points end in a little Cartilagi-

nous Head, and in the natural State, a ſhort Ligament with a little round Bone or Cartilage, runs down from each of theſe Heads, as we ſhall ſee in examining the freſh Bones.

389. The ſmall Cornua are placed on the Symphyſes of the large ones, almoſt perpendicularly, being only inclined a little outward and backward. They are joined by a Cartilaginous Symphyſis peculiar to them; and are themſelves Cartilages in young People, but they afterwards oſſify, though not always at the ſame Age, and at laſt their Symphyſes are loſt. The length of theſe Cornua varies pretty much; and at the upper Extremity of each of them, we ſometimes meet with one or more additional Portions, in the ſhape of little oblong Pearls, or of little Pillars ſet upon one another and held together by a kind of Ligament more or leſs Cartilaginous, of which hereafter. The Subſtance of theſe Appendices is different in different Ages, in the ſame manner as that of the Cornua themſelves.

*Connexion.* 390. The Connexion of the Os Hyoides not being by Articulation, does not belong to the Deſcription of the Sceleton, and therefore muſt be referred to the account of the freſh Bones, and of the Tongue. It will be ſufficient to obſerve here that it is connected by a Ligamentary Symphyſis with the Styloide Apophyſes, the Cartilago Thyroides of the Trachea Arteria, and the Epiglottis: it is alſo connected by Muſcles, with other parts, as we ſhall ſee hereafter.

*Uſes.* 391. The chief Uſe of this Bone is to be the Baſis and Support of the Tongue. The pliableneſs of the ſmall Cornua are likewiſe believed to contribute to the perfection of Singing.

## §. 18. *The Bony Parts of the Organ of Hearing.*

*Situation in general.* 392. All the Bony Parts of the Organ of Hearing, or Bones of the internal Ear, being contained in the inferior Portions of the Oſſa Temporum; it will be very proper to recollect what has been already ſaid about theſe No. 255, *&c.* and eſpecially to conſider well the particular Situation of the Apophyſis Petroſa, it's Baſis, Apex and Sides, and alſo of the Maſtoide Apophyſis, with the Eminences, Cavities, Holes, *&c.* which lie thereabouts.

393. All the Bony Organ of Hearing may very naturally be divided into four general parts; 1. The external Meatus Auditorius; 2. The Tympanum or Barrel of the Ear; 3. The Labyrinth; 4. The internal Meatus Auditorius. It may likewiſe be divided into immoveable or containing parts, which take in all the four already mentioned; and moveable or contained parts, which are four little Bones lodged in the Tympanum, called Incus, Malleus, Stapes, and Os Orbiculare or Lenticulare.

*External Meatus Auditorius.* 394. The external auditory Paſſage begins by the external auditory Hole, the Edge of which is rough and prominent; but backwards towards the Maſtoide Apophyſis it appears very much ſloped. The Paſſage itſelf is about half an Inch in length, running obliquely from behind forward, in a curve Direction, and ſometimes winding a little in the middle, like a Screw.

It's Cavity is almoſt Oval, wider at the entry than at the middle, after which it widens again by degrees.

395. It terminates inwardly by an even circular Edge lying in a Plane very much inclined, the upper part of it being turned outward, and the lower part inward; ſo that the whole Canal is longer on the lower Side than on the upper. The concave Side of the circular Edge is grooved quite round.

396. In Children this bony Canal is wanting, as well as the Maſtoide Apophyſis; and the inner circular Edge is a diſtinct Ring, which, in an advanced Age, unites intirely, and becomes one piece with the reſt. It is termed the bony Circle in Infants, and indeed it is very eaſily ſeparated from all the other parts.

397. It would ſeem therefore that the whole bony Canal in Adults is only a prolongation of the bony Circle in Children; becauſe even in a more advanced Age, the whole Canal may without much difficulty be taken out. The circular Groove lies between the Maſtoide Apophyſis and the articular Fiſſure or Crack.

*Figure and Situation of the Tympanum.*

398. The Tympanum or Barrel of the Ear is a Cavity irregularly Semiſpherical, the bottom of it being turned inward, and the Mouth joined to the circular Groove already mentioned. Both Eminences and Cavities are obſervable in it.

*Eminences.*

399. The remarkable Eminences are three in number; a large Tuberoſity lying in the very bottom of the Barrel, a little toward the back part; and a ſmall irregular Pyramid ſituated above the Tuberoſity, and a little more backward; the Apex of it is perforated by a ſmall Hole, and on one ſide of the Baſis, two ſmall bony Filaments are often found in a parallel Situation, and indeed, I believe they are ſeldom wanting, though their tender Structure expoſes them to be often broken: In the third Eminence is a Cavity ſhaped like the Mouth of a Spoon, ſituated at the upper and a little towards the anterior part of the bottom of the Tympanum. This Cavity is part of a Half-Canal, of which hereafter; and at a very ſmall diſtance from it's Point is a little bony Ridge which goes from one Edge of it to the other, but is ſometimes not entire.

*Cavities.*

400. The principal Cavities in the Tympanum are, the Opening of the Maſtoide Cells or Sinuoſities; the Opening of the Euſtachian Tube; the bony Half-Canal; the Feneſtra Ovalis and Rotunda; and to theſe may be added the ſmall Hole in the Pyramid.

401. The Opening of the Maſtoide Cells is at the poſterior and upper part of the Edge of the Barrel. The Cells themſelves which end there are dug in the Subſtance of the Maſtoide Proceſs, being very irregular and full of windings and turnings.

402. The opening of the Euſtachian Tube is at the anterior and a little toward the upper part of the Edge of the Barrel. This Tube, in *France* generally termed the Aqueduct, runs from the Tympanum, towards the poſterior Openings of the Naſal Foſſæ, and Arch of the Palate. The bony Portion thereof, of which alone I here ſpeak, is dug in the Apophyſis

Petroſa, along the Duct of the Carotide Apophyſis, and when it leaves that, it is lengthened out by the ſpinal Apophyſis of the Os Sphenoides. Theſe two Cavities, the Maſtoide Cells, and the Euſtachian Tube, are, in ſome meaſure, Prolongations of the Tympanum, one anterior, the other poſterior.

403. The bony Half-Canal, of which the Cavity reſembling the Mouth of a Spoon is the Extremity, lies immediately above the Euſtachian Tube, towards the upper ſide of the Apophyſis Petroſa, or rather in the very Subſtance of that upper Side. In a natural State, a ſmall Muſcle is lodged in it.

404. The Feneſtra Ovalis is a Hole of communication between the Tympanum and Labyrinth. It lies immediately above the Tuberoſity, the upper ſide of it being a little rounded, the lower a little flatted; and one Extremity being turned forward, the other backward. Towards the Labyrinth, this Opening has a little flat thin Border quite round it, which renders it narrower at that place than any where elſe.

405. The Feneſtra Rotunda is ſomething leſs than the Ovalis, and ſituated in the lower and a little towards the poſterior part of the large Tuberoſity; the Opening of it, which is the Orifice of a particular Duct in the Labyrinth, lying obliquely backward and outward.

406. The Hole in the Apex of the Pyramid is the Orifice of a Cavity, which may be named the Sinus of this Pyramid.

*Oſſicula Auditus.* 407. The Tympanum contains ſeveral little Bones, called the Bones of the Ear. They are generally four in number, denominated from ſomething to which they are thought to bear a reſemblance, *viz.* Incus, Malleus, Stapes, and Os Orbiculare or Lenticulare.

*Incus.* 408. The Incus or Anvil reſembles, in ſome meaſure, one of the anterior Grinders with it's Roots at a great diſtance from each other; at leaſt it comes nearer to this than to the ſhape of an Anvil. It may be divided into a Body and Branches. The Body is a large Subſtance, the Branches or Legs are two, one long and one ſhort. The Body is turned forward, the ſhort Leg backward, and the long Leg downward.

409. The Body of the Incus is broader than it is thick. It has two Eminences, and two Cavities between them, much in the ſame manner as we ſee in the Crown of the firſt Grinders.

410. The ſhort Leg is thick at it's Origin, and from thence decreaſing gradually, it ends in a Point. It is ſituated Horizontally, it's Point being turned backward, and joined to the Edge of the Maſtoide Opening of the Tympanum.

411. The long Leg viewed through the external auditory Paſſage, appears to be ſituated Vertically; but if we look upon it either on the fore or backſide, we ſee it is inclined, the Extremity of it being turned much more inward than the Root or Origin. The Point of the Extremity is a little flatted, and bent inward like a Hook, and ſometimes a little hollowed like a kind of Ear-picker. By this we may diſtinguiſh the Incus of one Ear from that of the other, when out of their places; for, turning the ſhort

Leg backward and the long Leg downward, if the Curvature of this long Leg be toward the left hand, the Bone belongs to the right Ear; if towards the right, it belongs to the left Ear.

412. The Malleus or Hammer is a long Bone, with a large Head, a ſmall *Malleus.* Neck, an Handle, and two Apophyſes, one in the Neck, the other in the Handle.

413. The Top of the Head is conſiderably rounded, and from thence it contracts all the way to the Neck. Both Head and Neck are in an inclined Situation, and the Eminences and Cavities in it anſwer to thoſe in the Body of the Incus.

414. The Handle is looked upon by ſome, as one of the Apophyſes of the Malleus; and in that Caſe, it is the greateſt of the three. It forms an Angle with the Neck and Head, near which, it is ſomething broad and flat, and decreaſes gradually toward it's Extremity.

415. The Apophyſis of the Handle, termed by others, the ſmall or ſhort Apophyſis of the Malleus, terminates the Angle already mentioned, being extended towards the Neck, and lying in a ſtrait Line with that ſide or border of the Handle which is next it.

416. The Apophyſis of the Neck, called alſo Apophyſis Gracilis, is in a natural State very long, but ſo ſlender withal, that it is very eaſily broken, eſpecially when dry; which is the reaſon why the true Length of it was for a long time unknown. It ariſes from the Neck, and ſometimes appears much longer than it really is, by the addition of a ſmall dried Tendon ſticking to it.

417. When the Malleus is in it's true Situation, the Head and Neck are turned upwards and inwards, the Handle downwards, parallel to the long Leg of the Incus, but more forward; the Apophyſis of the Handle upwards and outward, near the ſuperior Portion of the Edge of the Tympanum, near the Center of which is the Extremity of the Handle; and the Apophyſis Gracilis forward, reaching all the way to the articular Fiſſure in the Os Temporis. It is eaſy, after what has been ſaid, to diſtinguiſh the Malleus of the right Side, from that of the left.

418. The Stapes is a ſmall Bone, very well denominated from the reſemblance it bears to a Stirrup. It is divided into the Head, Legs and Baſis. *Stapes.*

419. The Head is placed upon a ſhort flatted Neck, the Top of it being ſometimes flat, ſometimes a little hollow.

420. The two Legs taken together, form an Arch, like that of a Stirrup, in the concave Side of which is a Groove, which runs through their whole length. One Leg is longer, more bent, and a little broader than the other.

421. The Baſis reſembles that of a Stirrup, both in it's oval Shape, and Union with the Legs, except that it is not perforated as the Stirrups now are, but ſolid, like thoſe of the Ancients. Round it's Circumference, next the Legs, is a little Border which makes that ſide of the Baſis appear a little hollow. The other ſide is pretty ſmooth, and half of the Circumference is ſomething more curve than the other.

422. The Subject being in an erect Poſture, the Stapes is to be conſidered as lying on it's Side, with the Head turned outward, near the Extremity of the Leg of the Incus; the Baſis, inward, being fixed in the Feneſtra Ovalis; the longeſt Leg backward; the ſhorteſt forward, and both in the ſame Plane. By this Situation, it is eaſy to know the Stapes belonging to each Ear.

*Os Orbiculare.*

423. The orbicular or lenticular Bone is the ſmalleſt Bone in the Body. It lies between the Head of the Stapes and Extremity of the long Leg of the Incus, being articulated with each of theſe. In dry Bones, it is found very cloſely connected, ſometimes to the Stapes, ſometimes to the Incus; and might in that State be eaſily miſtaken for an Epiphyſis of either of theſe Bones.

*Labyrinth.*

424. The Labyrinth is divided into three Parts, the anterior, middle, and poſterior. The middle Portion is termed Veſtibulum, the anterior, Cochlea, and the poſterior, the Labyrinth in particular, which comprehends the three ſemicircular Canals.

425. It is proper here to call to mind the true Situation and Direction of the Apophyſis Petroſa. This being ſuppoſed, the Cochlea lies forward and inward, towards the Extremity of the Apophyſis; the ſemicircular Canals, backward and outward, toward the Baſis of the Apophyſis; and the Veſtibulum between the other two.

*Veſtibulum.*

426. The Veſtibulum is an irregularly round Cavity, leſs than the Tympanum, and ſituated more inward and a little more forward. Theſe two Cavities are, in a manner, ſet back to back, with a common Partition-Wall between them, perforated near the middle by the Feneſtra Ovalis, by which the Cavities communicate with one another.

427. The Cavity of the Veſtibulum is likewiſe perforated by ſeveral other Holes; on the outſide or towards the Tympanum, by the Feneſtra Rotunda, but this is commonly ſeen in dry Bones only; on the backſide, by the five Orifices of the ſemicircular Canals: on the lower part of the foreſide, by two Holes which are the Entry of the Cochlea, but one of them is ſhut up in freſh Bones; and on the foreſide, towards the internal Meatus Auditorius, oppoſite to the Feneſtra Ovalis, by a great many very ſmall Holes for the Paſſage of the Nerves. On the upper ſide there are only ſmall Pores.

*Semicircular Canals.*

428. The ſemicircular Canals are three in Number, one vertical and ſuperior, one vertical and poſterior, and one horizontal. The ſuperior vertical Canal is ſituated tranſverſely with reſpect to the Apophyſis Petroſa, the convex Side or Curvature of it being turned upward, and the Extremities downward, one inward, the other outward. The poſterior vertical Canal lies parallel to the length of the Apophyſis, the Curvature being turned backward, and the Extremities forward, one upward, the other downward; and the ſuperior Extremity of this Canal meets and loſes itſelf in the internal Extremity of the former. The Curvature and Extremities of the horizontal Canal are almoſt on a level; the Curvature lying obliquely backward, and the Extremities forward, ending under thoſe of the ſuperior vertical Canal,

but

but a little nearer each other ; and the inner being almoſt in the middle Space, between the Extremities of the poſterior vertical Canal.

429. The horizontal Canal is generally the leaſt of the three, the poſterior Vertical is often, and the ſuperior Vertical ſometimes, the greateſt ; and ſometimes theſe two are equal. All the three Canals are larger than a Semicircle, forming nearly three Quadrants ; they are broader at the Orifices than in the middle. Theſe Orifices open into the backſide of the Veſtibulum as had been ſaid, being but five in Number, becauſe two of them are loſt in each other, No. 428. So that in the poſterior part of the Veſtibulum, two appear towards the inſide, and three towards the outſide.

430. In Children, the Subſtance of theſe Canals is compact, while that which ſurrounds them is ſpungy, ſo that they may be eaſily ſeparated from the reſt of the Apophyſis Petroſa. In Adults, all the Parts of the Bone are ſo ſolid, that theſe Canals appear only like Paſſages dug in a piece of Ivory. From this Deſcription it is eaſy to diſtinguiſh the right Labyrinth from the left.

*Cochlea.*

431. The Cochlea is a ſort of ſpiral Shell, with two Ducts, formed in the anterior part of the Apophyſis Petroſa, in ſome meaſure reſembling the Shell of a Snail. The parts to be diſtinguiſhed in it, in it's true Situation, are the Baſis, the Apex, the ſpiral Lamina or Half-Septum by which it's Cavity is divided into two Half-Canals ; the Spindle round which the Cochlea turns, and laſtly the Orifices and Union of the two Ducts.

432. The Baſis is turned directly inward, toward the internal Foramen Auditorium, the Apex outward, and the Axis of the Spindle is nearly horizontal ; but in all of them allowance muſt be made for the Obliquity of the Os Petroſum in which they lie.

433. The Baſis of the Cochlea is gently hollowed, and towards the middle, perforated by ſeveral ſmall Holes. The Spindle is a kind of ſhort Cone, with a very large Baſis, which is the middle of the Baſis of the Coclea. Through it's whole length runs a double ſpiral Groove, which, through a a Microſcope, ſhews a great number of Pores.

434. The Cochlea makes about two turns and an half from the Baſis to the Apex ; and the two Ducts being ſtrictly united together through their whole Courſe, form an intire common Septum, which muſt not be confounded with the Half-Septum or ſpiral Lamina, as is often done. The firſt might be termed the common Septum, the other, the particular Septum or Half-Septum.

435. Both of them are cloſely joined to the Spindle, being thicker there, than in any other Place. The common Septum is complete, and ſeparates the turns intirely from each other ; whereas the Half-Septum in the Sceleton is only a ſpiral Lamina, the Breadth of which is terminated all round by a very thin Border lying in the middle Cavity of the Cochlea. In the natural State, there is a membranous Half-Septum which completes the partition between the two Ducts, as we ſhall ſee in deſcribing the freſh Bones.

436. The two Half-Canals turn jointly about the Spindle, one being ſituated towards the Baſis of the Cochlea, the other towards the Apex ; for

which reaſon I have always termed one of them Internal, the other External; the Diviſion of them into the upper and lower Flight, not being agreeable to the natural State, but liable to convey a very falſe Idea thereof.

437. THE Spiral or Volute of the Cochlea begins at the lower part of the Veſtibulum, runs from thence forward to the top, then backward down to the bottom, afterwards upwards and forward, and ſo on from the Baſis which is turned inward, to the Apex which is turned outward.

438. FROM this Deſcription it is eaſy to know to what Ear any Cochlea belongs when we ſee it prepared. It likewiſe teaches us that in the right Cochlea, the Direction of the Turnings is the ſame as in Garden Snails, and almoſt all the other common Shells; but in the left Cochlea, the Turnings are in a contrary Direction, as in one kind of Shell, which is rarely met with.

439. THE two Half-Canals communicate fully at the Apex of the Cochlea. Their ſeparate Openings are towards the Baſis, one of them being immediately into the lower part of the foreſide of the Veſtibulum, the other into the Feneſtra Rotunda. Theſe two Opening are ſeparated by a particular Turning, which ſhall be explained in deſcribing the Organ of Hearing.

*Foramen Auditorium Internum.*

440. THE internal auditory Hole is in the backſide of the Apophyſis Petroſa, in ſome meaſure behind the Veſtibulum and Baſis of the Cochlea. It is a kind of blind Hole, divided into two Foſſulæ, one large, the other ſmall. The large one lies loweſt, and ſerves for the Portio Mollis of the auditory Nerve or ſeventh Pair. The ſmall one is uppermoſt, and is the Opening of a ſmall Duct through which the Portio Dura of the ſame Nerve paſſes.

441. THE inferior Foſſula is full of little Holes, which, in the natural State, are filled with nervous Filaments of the Portio Mollis, which go to the Spindle, to the ſemicircular Canals, and to thoſe of the Cochlea. It is this Foſſula which forms the ſhallow Cavity at the Baſis of the Spindle of the Cochlea.

442. THE Paſſage for the Portio Dura of the auditory Nerve runs behind the Tympanum, and it's Orifice is the Stylo-Maſtoide Hole. *Falloppius* gave to this Duct the name of Aqueduct, from it's reſemblance to ſome Aqueducts in *Italy*. It begins by the ſmall Foſſula, and pierces from within, outwards, the upper part of the Apophyſis Petroſa making there an Angle or Curvature. From thence it is inclined backward, behind the ſmall Pyramid of the Tympanum, and runs down to the Stylo-Maſtoide Hole, through which it goes out and is diſtributed in the manner we ſhall ſee in the Deſcription of the Nerves. It communicates likewiſe by a ſmall Hole with the Sinus of the Pyramid, and lower down by another Hole with the Barrel of the Ear.

443. IN ſome Skulls this Aqueduct of *Falloppius* is open on the upper part of the Apophyſis Petroſa, a kind of Break appearing in it, formed by a double Hole. It is at this place that it makes the Angle already mentioned. But commonly it is covered with a bony Lamina.

§. 19.

### §. 19. *The ſupernumerary Bones of the Head.*

444. I call by the name of ſupernumerary Bones, ſeveral pieces found in ſome Skulls, chiefly between the Parietal and Occipital Bones. They form Breaks in the lambdoidal Suture, and are joined by true Sutures, to the Bones already mentioned.

445. Their Figure, Number and Size vary very much. They are ſometimes in ſome meaſure triangular, but oftener of no regular Figure. In ſome Subjects they incroach on the Occipital Bone, in others, on the Parietal Bones, and ſometimes they extend themſelves every way. They are commonly indented, and broader on the outſide of the Skull than on the inſide, in which they are without any viſible Indentations; and ſometimes are ſcarcely to be ſeen, when they are ſmall on the outſide.

446. They have been termed Keys, a name given by Joiners, to the Pieces which ſerve to ſtrengthen the Joints of Boards; but which can agree to them only in reſpect to their Situation, and not in reſpect to their Uſes in the Cranium or other Bones of the Head. They may ſerve to multiply the ordinary Sutures, *&c.*

447. Some ſuch Bones have likewiſe been found in the Joints between the Bones of the Head and Face; and between thoſe of the Bones of the Face, with each other; and to theſe might be added the ſupernumerary Teeth placed out of the Rank of the reſt.

## ART. III.

### *The Bones of the Trunk.*

448. THE Trunk comprehends all the Bones, which in a natural State lie between the Head and the four great Extremities. Theſe Bones are divided into three Parts, the Spine, Thorax, and Pelvis; the firſt of which, that is, the Spine, may be looked upon as a common Part, the other two as proper.

### §. 1. *The Spine and Vertebræ in general.*

449. By the Spine is meant all that Order of Bones which follow one another without interruption, from the Os Occipitis, downward, along the poſterior part of the Trunk. *Extent and Situation in general.*

450. It repreſents a very compound folding Pillar, round on the foreſide, and on the backſide ſtuck full of Prickles or Points, repreſenting ſo many particular Spines; having a Canal in the middle, through it's whole length, into which a great number of Holes open on each ſide. When it is viewed directly on the fore or backſide, it appears ſtrait, and to be made up of different Portions of Pyramids in a contrary Situation to each other; but viewed ſidewiſe, it preſents ſeveral different Curvatures. *Figure.*

451. The

*Diviſion.*

451. The Pieces which form the Spine are of two kinds, one ſingle, the other compound. The ſingle Pieces are generally twenty-four in Number, called by the name of Vertebræ; the compound Pieces are two, the Os Sacrum and Os Coccygis; the ſingle Pieces are likewiſe called true Vertebræ, to diſtinguiſh them from the Portions which compoſe the other two, which are called falſe Vertebræ.

452. The true Vertebræ are divided into three Claſſes, *viz.* ſeven Vertebræ of the Neck; twelve of the Back, and five of the Loins, to which are likewiſe given the names of cervical, dorſal, and lumbar Vertebræ.

453. To have a clear Idea of the Structure and Diſpoſition of each Vertebra, we muſt firſt examine what they have in common, and next what is peculiar to the Vertebræ of each Claſs, or to any particular Vertebræ therein. Afterwards, the Deſcription of the Portions which compoſe the Os Sacrum and Coccygis, will complete this firſt part of the Trunk.

454. What is common to all the Vertebræ, may be reduced to their external Conformation, internal Structure, Connexion and Uſes.

*External Conformation and Diviſion of each Vertebra.*

455. In the Vertebræ in general we are to conſider the Body, Apophyſes and Cavities.

*Body of the Vertebræ.*

456. By the Body of the Vertebræ, we mean that principal part or large Maſs, ſituated anteriorly, and which ſupports all the other Parts. In moſt of the Vertebræ, the Body repreſents a Portion of a Cylinder cut tranſverſely, the Circumference of which is more or leſs round on the forepart, and ſloped on the back part. It has two Sides, the upper and lower, each of which is, as it were, bordered by a thin Lamina in form of an Epiphyſis.

*Apophyſes.*

457. The Apophyſes in moſt of the Vertebræ are ſeven in number: one poſterior, called the ſpinal Apophyſis, which ends in a ſmall Epiphyſis, and has given the Name to the whole Syſtem of the Vertebræ: two lateral, called tranſverſe Apophyſes; and four, which are likewiſe lateral, two on each ſide, one above, and one below. They are called by the general name of oblique Apophyſes, and diſtinguiſh into ſuperior or aſcending, and inferior or deſcending. Theſe four are the leaſt of all the Proceſſes of the Vertebræ, and each of them has a cartilaginous Side. I ſhould chuſe to call them articular rather than oblique Apophyſes, for a reaſon which ſhall be afterwards given, and I ſometimes name them likewiſe the ſmall Apophyſes of the Vertebræ.

*Cavities.*

458. The Cavities in the Vertebræ are theſe: a large middle Hole, between the Body and Apophyſes; four Notches, two on each ſide, one ſuperior and ſmall, and one inferior, which is larger. The great Foramen is part of the vertebral or ſpinal Canal, and the Notches of one Vertebra meeting thoſe in another, form the lateral Holes, which communicate with the Canal.

*Situation in particular.*

459. Tho' the Situation of the Vertebræ has been already mentioned pretty exactly, it will be proper to repeat it again. The Body is the anterior part of each Vertebra; the ſpinal Proceſs, the poſterior Part; the tranſverſe and oblique or articular Proceſſes are the lateral Parts; and the great Foramen is in the middle of all theſe Parts.

*Internal Structure.*

460. The inner Subſtance is ſpungy or like a Diploë, covered with an outer compact Subſtance which in the Body of the Vertebræ is very thin, but thicker in the Proceſſes.

*Connexion.*

461. The Vertebræ are joined together by their Bodies and by their ſmall Apophyſes. The Bodies in a natural State are principally united by a Cartilaginous Symphyſis, that is, by the intervention of a pliable and elaſtic Cartilage, as we ſhall ſee in deſcribing the freſh Bones. This Cartilaginous Connexion makes the lateral Holes of the Spine larger in the Body than in the Sceleton, where theſe Cartilages are wanting.

462. Their Connexion by the ſmall Apophyſes, is by Arthrodia, and not by Ginglymus, as ſhall be afterwards ſhewn. Theſe two Articulations are ſecured by very ſtrong Ligaments, of which in another place.

## §. 2. *Vertebræ of the Neck.*

*The Body.*

463. In moſt of the Vertebræ of the Neck, the Body is a little flatted anteriorly, and is thinner or ſhorter than that of all the other Vertebræ of the Spine. The upper Side is a little concave, the lower proportionably convex. The breadth on the fore part increaſes gradually as they deſcend; ſo that taken all together they repreſent a ſort of Pyramid. All that is here ſaid is not to be extended to the two firſt Vertebræ, nor to the ſeventh.

*Spinal Proceſſes.*

464. The ſpinal Apophyſes are more or leſs ſtraitened, and forked at the Extremity, except in the firſt Vertebra which has no ſuch Proceſs.

*Tranſverſe Apophyſes.*

465. The tranſverſe Apophyſes are for the moſt part very ſhort, perforated perpendicularly, concave or grooved on the upper ſide, a little forked, and, as it were, double, except in the firſt and laſt Vertebræ, in which theſe Apophyſes are longer, and more pointed.

*Oblique Apophyſes.*

466. The articular Apophyſes, except the firſt, are more oblique than in the other Vertrebræ, and their Cartilaginous Sides are inclined in ſuch a manner as that in each Vertebra, the ſuperior Apophyſes are turned backward and upward; the inferior forward and downward. Some particularities in the two firſt Vertebræ are here likewiſe to be excepted.

*Firſt Vertebra of the Neck.*

467. The firſt Vertebra is called Atlas, becauſe it ſupports the Head, as Atlas did the Globe of the Univerſe, according to the ancient Fable. It is neither Body nor ſpinal Apophyſis. The Hole or Opening in it is much larger than in the reſt. It looks like an irregular bony Ring filled all round with Eminences and Cavities. It may be divided into two Arches; the anterior or largeſt, and poſterior or ſmalleſt.

468. The anterior Arch is formed by two thick lateral Portions, and a ſmall curve middle part, which with the other two makes a Notch in the anterior part of the great Cavity of the Vertebra. The lateral Portions may be looked upon as a Body in two parts, without which the firſt Vertebra would have been too weak to ſuſtain the Articulations.

469. In the middle of the convex Side of the poſterior Arch is a Tubercle a little pointed, larger than the anterior Tubercle, and marked with

muſcular Impreſſions on each ſide, and on the upper and lower Edge. This Tubercle ſeems to be in the place of a ſpinal Apophyſis.

470. The tranſverſe Apophyſes of the firſt Vertebra ariſe from the middle of the breadth of the lateral Portions, being perforated perpendicularly at their broad Origins. They are much longer than thoſe of the five Vertebræ below them, and contracting gradually, they terminate in an obtuſe Point, which is ſometimes in a manner double, and marked on the upper and lower ſide with Muſcular Impreſſions.

471. The ſuperior articular Apophyſes are larger than any other Apophyſes of the ſame kind in the whole Spine. They are oblong Cartilaginous Cavities framed in the upper ſide of the lateral Portions. Their Situation is almoſt Horizontal, and their anterior Extremities are turned more inward, that is, nearer one another than the poſterior. They are, in a word, every way proportioned to the Condyles of the Os Occipits.

472. The inferior articular Apophyſes are leſs hollow, ſhorter and broader. They are inclined laterally from within outwards, and from above downward. They are directly under the ſuperior Apophyſes; and thus the articular and tranſverſe Apophyſes, the Holes and lateral Portions on each ſide are all in the ſame Line.

473. There is a long Notch or kind of Groove between each ſuperior articular Apophyſis, and the poſterior Arch of the bony Ring, reaching from the Hole in the tranſverſe Apophyſis backward: in which Notch, the vertebral Blood-Veſſels in the natural State make a turn, before they enter the great Occipital Foramen. Sometimes, though very rarely, there is a complete Hole in the room of this Groove. There is another Notch, but more ſhallow, on each Side, between this Arch and the inferior Apophyſes.

474. In the internal Circumference of the great Hole of this Vertebra, in the middle of the great Notch, is a Cartilaginous Impreſſion for the Articulation of the Axis of the ſecond Vertebra; and on each ſide of that Notch, between the ſuperior and inferior Apophyſes, there is another ſmall Impreſſion for the Inſertion of a tranſverſe Ligament, which ſecures the Axis in it's place. All round this Circumference, both toward it's upper and lower Edges, there are many other Inequalities or Impreſſions.

*Second Vertebra.*

475. The ſecond Vertebra of the Neck is very different from the firſt. It's Body is narrower and longer than that of the following Vertebræ; and it's length is increaſed on the upper part by an Eminence, like a Pivot or Axis, called by the *Greeks* Odontoides, by the *Latins* Dentiformis or ſimply Dens.

476. In this Axis four Impreſſions or Marks are obſervable; one anterior which is Cartilaginous, for it's Articulation by a like Impreſſion, with the great Notch in the firſt Vertebra; one poſterior, for the Inſertion of the tranſverſe Ligament already mentioned; two ſuperior, which unite at the Point of the Axis, and ſerve for the inſertion of the Ligaments by which the Axis is faſtened to the anterior Edge of the Occipital Hole.

The ſuperior Portion of the Axis is a true Epiphyſis grafted upon a forked Apophyſis.

477. The ſpinal Apophyſis is ſhort, broad, and very much forked, being diſtinguiſhed into two lateral Parts by a kind of angular Criſta. The lower Side of it is hollow, and the Cavity is angular, and divided into two lateral Parts by a Bony Line.

478. The tranſverſe Apophyſes are very ſhort, a little inclined downward, and perforated obliquely; whereas in all the other Vertebræ theſe Perforations are perpendicular. When the Apophyſes are thin, this Obliquity does not appear ſo much; but when they are thick, the Hole is more like a true Canal, bent in ſuch a manner as that one Orifice is downward, the other outward. The Apophyſes themſelves end in a Point turned downward.

479. The ſuperior articular Apophyſes do not anſwer exactly to the inferior Apophyſes of the firſt Vertebra. Their Cartilaginous Sides are inclined obliquely outward and downward; and as they are narrower than the former, and have their Edges more raiſed toward the outſide, a ſmall empty Space is commonly left between the two, on the fore and back Parts, in the Sceleton: the Reaſon of which appearance ſhall be given in the Hiſtory of the freſh Bones. The ſuperior Apophyſes of this Vertebra, the tranſverſe Proceſſes of the firſt and their Holes are all in the ſame perpendicular Line.

480. The inferior Apophyſes are leſs, and ſituated further back. Their Cartilaginous Sides are turned backward, and very obliquely, inclined from below upward, and from before, backward, ſo that their Situation is more Vertical than Horizontal. They are likewiſe a little hollow.

481. The ſuperior Notches are ſuperficial, long, ſituated behind the ſuperior Apophyſes, and inſenſibly diſappear toward the ſpinal Apophyſes. The inferior Notches are ſituated more forward, directly under the tranſverſe Apophyſes, and their Holes. The Body of this Vertebra has a very ſmall Tubercle on the fore Side.

*Third Vertebra.*

482. The Conformation of the third Vertebra of the Neck is not very different from that of the Vertebræ of the Neck in general already deſcribed. The ſuperior Apophyſes anſwer to the inferior Apophyſes of the ſecond Vertebra, their Cartilaginous Side being a little convex and turned backward. The inferior Apophyſes are a little hollow and turned forward.

483. The tranſverſe Apophyſes are very ſhort, and placed before the articular ones. They are ſomething forked and depreſſed on the upper Side, between the lateral Hole and the Extremity. The Notches are turned a little forward, above and below the tranſverſe Apophyſes, and the lower are deeper than the upper.

*Fourth, fifth and ſixth Vertebræ.*

484. The fourth, fifth, and ſixth Vertebræ are like the third, except that their Bodies are gradually more extended, but ſtill hollow on the upper Side, and convex on the lower; and that the ſpinal Apophyſis of the ſixth Vertebra is longer, thinner, and ſtraiter than in the three above it. The inferior Apophyſes of the fourth and fifth Vertebræ, and the ſuperior of the ſixth are not ſo much inclined as thoſe above them.

*Seventh Vertebra.* 485. The Body of the laſt Vertebra of the Neck is the largeſt of all, ſo that, as has been already ſaid, all the ſeven repreſent a ſort of Pyramid ſet on the Vertebral Pillar of the Back. The lower Side of the Body of this Vertebra is almoſt flat. The ſpinal Apophyſis is long, almoſt ſtrait and very prominent, for which Reaſon it has been termed Prominens in *Latin.* It ends in a little flat Head, ſometimes ſmooth, and ſometimes a little depreſſed or forked.

486. The tranſverſe Apophyſes of this Vertebra are longer, placed further back, and leſs grooved than the former. Their Holes are ſometimes double, and in that caſe, leſs than when they are ſingle: and ſometimes there is a Break or Opening in them like a Notch, which variety is alſo obſervable in the ſixth Vertebra.

487. The ſuperior Apophyſes are like thoſe of the other Vertebræ, but in the inferior, the Sides are more inclined and broader, anſwerably to the ſuperior Apophyſes of the firſt Vertebra of the Back.

488. In the ſix lower Vertebræ of the Neck, the middle Holes are much larger than in the Vertebræ of the Back. They are in ſome meaſure triangular, being broad on the Fore-ſide, and contracted on the back-ſide.

## §. 3. *Vertebræ of the Back.*

489. The Bodies of the Vertebræ of the Back are longer than thoſe of the Neck, and in all of them, except the firſt, the upper Side of which is a little hollow, both upper and lower Sides are equally flat.

490. From the firſt Vertebra to the fourth or fifth, their Bodies are contracted between the upper and lower Sides, gradually more in the lower Vertebræ; and in the ſame manner, they grow broader between the fore and back Sides: ſo that when viewed on the fore-ſide, they repreſent an inverted Pyramid or Cone, but viewed laterally, they repreſent a Pyramid in it's natural Situation.

491. From the fourth Vertebra to the laſt, the Size of the Bodies gradually increaſes, but more between the upper and lower than between the fore and back Sides. Therefore when the whole Pillar of the Dorſal Vertebræ is viewed on the fore Side, a ſenſible Contraction is perceivable in the upper half of the Pillar, which does not appear in a lateral View.

492. The ſpinal Apophyſes are long, ſharp on the upper Side, and a little hollow on the lower, in which there is often a ſmall bony Line directly oppoſite to the ſharp Edge. They end in a ſort of little pointed Head. They are very much inclined downward, except the firſt three or four, which are ſtraiter and ſhorter in proportion to their nearneſs to the Vertebræ of the Neck. The three laſt grow likewiſe ſtraiter by Degrees as they deſcend, and are broader and ſhorter than thoſe above them.

493. The articular Apophyſes are ſituated almoſt directly above and below the tranſverſe, and their Sides are rather perpendicular than oblique. The Sides of the ſuperior Apophyſes are a little convex and turned backward; the inferior a little concave and turned forward.

494. The tranſverſe Apophyſes are pretty long, but their length diminiſhes by degrees all the way to the twelfth Vertebra, in which they are both very ſhort and very ſmall. They end in a ſort of Head ſet upon a narrow Neck. In the anterior Part of theſe Heads are Cartilaginous Cavities anſwering to the Tubercles in the Ribs. Theſe Cavities diminiſh by degrees as they deſcend, and in the two laſt Vertebræ there are ſcarce any to be ſeen. In the upper Vertebræ they are ſituated more forward than in the following, in which they remove gradually outward.

495. The lateral Notches are between the articular Apophyſes and Bodies of the Vertebræ, and the inferior are the moſt hollow.

496. Most of theſe Vertebræ have four ſmall Cartilaginous Impreſſions, two on each Side of their Bodies, one at the upper Edge, the other at the lower, near the articular Apophyſes. Theſe Impreſſions are obliquely hollow, and diſpoſed in ſuch a manner as that the inferior in the Body of one Vertebra and the ſuperior in the next below, form a ſort of Niche, in which the Heads or Ends of the Ribs are articulated. In the firſt Vertebra there is commonly an intire Niche for the firſt Rib, and half of another for the ſecond. The two laſt Vertebræ have generally but one entire Niche on each ſide. Theſe Marks are peculiar to the Vertebræ of the Back, and eaſily diſtinguiſh them from the reſt.

497. In the lower articular Apophyſes of the laſt Vertebra, the Sides are turned laterally from within outward, and are likewiſe a little convex: for which reaſon this Vertebra is received both above and below; whereas the firſt Vertebra of the Neck receives both way. Beſides the ſeven ordinary Apophyſes, this laſt Vertebra has often two ſmall ones between the tranſverſe and ſuperior articular Apophyſes.

498. The large middle Holes in the Vertebræ of the Back grow rounder and narrower as they deſcend, eſpecially from the firſt to the tenth, where they begin again to be more flat and more extended nearly in the ſame manner as in the two firſt.

499. All theſe large Holes, each of which ought to be looked upon as a Portion of a Canal, have a Notch in the back ſide above the ſpinal Proceſſes, and between the articular Apophyſes. In moſt of the Vertebræ of the Neck, we meet likewiſe with large Notches or Slopes, above the ſpinal Apophyſes; but as they are very broad and ſhallow, they are but little regarded. In the laſt Vertebra of the Neck this Notch is remarkable enough, and that in the laſt Vertebra of the Back appears to be deeper than any of the reſt.

## §. 4. *Vertebræ of the Loins.*

500. Bodies of the Vertebræ of the Loins are the largeſt in the whole Spine, and as they deſcend they increaſe, tho' much more in breadth than in thickneſs; that is, more between the upper and lower Sides, than between the Back and fore Sides. Between the upper and lower Sides they are a little contracted in the middle, and their Edges are conſequently prominent.

501. The ſpinal Apophyſes are ſhort, ſtrait and broad on each Side, but narrow on the upper and lower Parts. The upper Edge is ſharp; the lower divided as it were into two Labia by a narrow Ridge more or leſs prominent. The Extremities ſwell a little, and the ſpinal Apophyſis of the fifth Vertebra is ſhorter and narrower than the reſt, and bent a little downward.

502. The tranſverſe Apophyſes are longer and more ſlender than in the Vertebræ of the Back; they increaſe in length from the firſt to the third, and then diminiſh, to the fifth. They are flat on the back Part, and more even on the fore Part.

503. The ſuperior articular Apophyſes of all theſe Vertebræ are hollowed lengthwiſe; the inferior are convex lengthwiſe, and placed nearer each other than the ſuperior. The Cavities are turned inward or toward each other, the Convexities outward and from each other; ſo that they are ſituated in two different Planes more or leſs parallel to the Planes of the Apophyſes.

504. This Direction changes by ſmall Degrees as the Vertebræ deſcend; and thus in the fifth Vertebra the Sides of the inferior Apophyſes are turned a little more forward.

505. Besides theſe ſeven Apophyſes, each Vertebra has two additional ones near the ſuperior Apophyſes. The lower ſide of the Body of the laſt Vertebra is obliquely inclined forward, ſo that it is much longer before than behind.

506. The great Foramina in theſe Vertebræ are larger than in thoſe of the Back. They are flatted on the fore Side, and almoſt angular behind, much in the ſame manner as in the Vertebræ of the Neck.

## §. 5. *Os Sacrum.*

*Situation in general.*

507. The Os Sacrum is ſituated in the poſterior and lower part of the Trunk, as the Baſis by which the whole Spine is ſupported, and from hence it has by ſome been termed Os Baſilare.

*Figure and Diviſion.*

508. It's Figure comes near that of a long Triangle with the Baſis upward and the Apex downward. It may be divided into the upper Part or Baſis; the lower Part or Apex; two Sides, the anterior or concave, and the poſterior or convex; and two lateral Parts or Edges. We here conſider it as one Bone only, as it is in an Adult Subject.

509. In young Subjects it is made up of ſeveral diſtinct Pieces termed falſe Vertebræ, united together by Cartilages which in time diminiſh, grow hard, and diſappear, leaving no Marks behind them but little Ridges or Lines more or leſs prominent. Theſe Pieces are five in number, and ſometimes ſix, all of them reſembling the Vertebræ in ſomething. The firſt is much larger than any of the true Vertebræ; but their ſize diminiſhes by very great Degrees as they deſcend, ſo that the loweſt which makes the Point of the Os Sacrum has ſcarcely the appearance of a Vertebra.

*Anterior Side.*

510. In the anterior or concave Side, we ſee commonly four pair of large Holes, and ſometimes more, (according to the number of falſe Vertebræ) diſpoſed in two longitudinal Rows, and appearing to be formed by the Notches in the original Pieces meeting each other. Between theſe two

Rows of Holes, through the whole length of the middle of this Side, we obſerve the Bodies of five or ſix falſe Vertebræ cemented together, of which the uppermoſt or firſt comes nearer to the Structure of a true Vertebra than the reſt. The laſt is very ſmall, and below the Holes, it has a Notch on each ſide, and ſometimes a Production in ſhape of a little Horn.

511. The poſterior or convex Side is very uneven. The ſame number of Holes appear here, as in the fore Side, and diſpoſed in the ſame Order, but they are not ſo large. Between the two Rows of Holes is a ſort of ſpinal Apophyſis more or leſs imperfect, eſpecially toward the upper Part. In theſe Apophyſes we often find Openings, ſometimes in the ſuperior, ſometimes in the inferior; and thus perpendicular Fiſſures are formed of different breadths. Sometimes a tranſverſe Opening is left between the ſeveral Spines; but in all that has been here ſaid, great Varieties are obſervable. On the outſide of each Row of Holes are Tuberoſities which appear like tranſverſe and articular Apophyſes confounded together. *Poſterior Side.*

512. At the Baſis or upper Part of the Os Sacrum are two true articular Apophyſes anſwering to the inferior ones of the laſt Vertebra of the Loins. Below each of theſe Apophyſes, laterally, is a large Notch; and between them we ſee diſtinctly enough the upper Side of the Body of the firſt falſe Vertebra, which is like that of the Lumbar Vertebræ, being very much inclined backward; ſo that the Body of this falſe Vertebra, as well as of the laſt true one, is longer before than behind. From this Obliquity it happens, that the Os Sacrum and laſt Lumbar Vertebra form at their Connexion a very conſiderable Angle.

513. Behind the Body of this firſt Vertebra of the Os Sacrum, between the articular Apophyſes, lies the Orifice of a large Canal, triangular and flat, which runs down in the middle Subſtance of the Bones between the two Sides, and between the four Rows of Holes, behind the Bodies of all the falſe Vertebræ It contracts as it deſcends, and communicates with all the large Holes, being the Continuation of the great Canal of the Spine. It is often broke into by the Fiſſures already mentioned, on the back Side.

514. The lateral Parts are broad toward the top, forming on each hand a large, uneven, irregular Cartilaginous Surface in the Figure of a great S, and ſometimes of a Bird's Head. By theſe two Sides the Os Sacrum is connected with the Oſſa Innominata by a Cartilaginous Symphyſis. Between each of theſe lateral Sides and the neareſt poſterior Holes there is a large rough Depreſſion, and under that, another not ſo large. Theſe Depreſſions are often pierced by ſeveral Holes, which loſe themſelves in the inner Subſtance of the Bone. *Lateral Parts.*

## §. 6. *Os Coccygis.*

515. The Os Coccygis, ſituated at the Extremity of the Os Sacrum, is in ſome meaſure an Appendix thereof. The Figure of it is ſomething like that of an inverted Pyramid, a little bent forward toward the Pelvis, or like a Cuckoo's Bill. The anterior Side is flat, the poſterior a little convex.

It is made up of four or five Pieces, like falſe Vertebræ, joined together by Cartilages more or leſs pliable. Sometimes all the Pieces are intirely cemented together.

516. The firſt Piece is the largeſt, and on each ſide of it's Baſis there are ſometimes ſmall Apophyſes or Cornua, joined cloſely to the Extremity of the Os Sacrum. It has alſo ſometimes a kind of tranſverſe Apophyſes, with ſmall Notches on their upper Part, which joining with thoſe in the laſt Piece of the Os Sacrum form a pair of Holes, ſituated in the ſame row with the other large ones. The other Pieces of the Os Coccygis are a kind of irregular Squares, diminiſhing in Size as they deſcend, ſo that the loweſt is like a Seſamoide.

## §. 7. *Uſes and Mechaniſm of the Spine.*

517. The Spine taken together is the ſupport of all the other Bones, and the univerſal Director of all the Attitudes neceſſary for their different Motions. To give a Machine both theſe Advantages, it muſt have two Properties, which at firſt ſight appear incompatible, *viz.* Strength and Flexibility or Pliableneſs; and it will ſtill be more perfect, if it be withal very light in proportion to it's Bulk.

518. The Author of nature has framed the Spine, with all theſe Advantages, in a manner which is the more wonderful, becauſe it is moſt ſimple. He has made the Spine flexible, by the number of Pieces of which it is compoſed: He has made it firm and ſtrong, by diſpoſing theſe Pieces, ſo as naturally to ſupport and ſuſtain each other, and by framing them in the moſt convenient manner for that infinite number of Cords by which they are bound together; and laſtly, their internal Structure renders them very light.

519. The Contrivance of this excellent Mechaniſm is not the ſame in all the three Claſſes of the Vertebræ. Thoſe of the Back and Loins ſuſtain each other eaſily enough by the Extent and Direction of their Bodies; and in all of them, this Diſpoſition is proportioned to the Weight they have to bear, the inferior Vertebræ being larger than thoſe above them.

520. The Contraction of this bony Pillar, at the fourth or fifth Vertebra of the Back, does not in the leaſt impair this Mechaniſm: for it being at that place in a particular manner ſtrengthened by the Connexion of the true Ribs, large Vertebræ would there have been uſeleſs; whereas, by diminiſhing their Size, the Capacity of the Thorax is increaſed, for the more commodious Reception of the Viſcera hereafter to be deſcribed.

521. In the Vertebræ of the Neck the Caſe is different; their Bodies are but of a ſmall extent, and the Sides of them narrow. Their Situation of the whole Row of theſe Vertebræ is oblique and inclined forward, except the two firſt, which are placed perpendicularly; ſo that this Portion of the bony Pillar is concave, the upper half of it being bent forward.

522. To be able to judge how far this Obliquity extends in a living Body; we need only either ſtand or ſit, holding our Head in a ſtrait poſture, that

is, turned neither to one ſide nor the other, and then obſerve the Situation of the Maſtoide Apophyſes; becauſe the Articulation of the firſt Vertebra of the Neck with the Condyles of the Os Occipitis is exactly between the anteterior Edges of theſe Apophyſes.

523. When a Man ſtands or ſits in an erect Poſture, the oblique Diſpoſition of theſe Vertebræ puts the oblique Sides of their articular Apophyſes almoſt in an horizontal Situation; ſo that they ſupport each other, not only by their Bodies, as in the other Vertebræ, but alſo by their articular Apophyſes, the Bodies being thus eaſed of part of their Burden.

524. The Obliquity of theſe Apophyſes appears particularly to facilitate the Rotation of the Neck, or that Motion by which it is turned round, as upon an Axis; for the natural oblique Situation of the Neck would have made that Motion very difficult without the Obliquity of the Apophyſes already mentioned. The Diſpoſition of the ſecond and third Vertebra, being more vertical than oblique, the lateral Inflexions of the Neck are thereby made more eaſy.

525. The Holes in the tranſverſe Apophyſes of the Vertebræ of the Neck form a ſort of Canal for the Paſſage of the Blood-Veſſels. The length of this Apophyſis in the firſt Vertebra enables it to turn more eaſily on the Axis of the Second; and the ſhortneſs of theſe Apophyſes in the other Vertebræ prevents them from injuring the neighbouring Parts in the lateral Inflexions of the Neck.

526. The length of the ſpinal Apophyſis of the ſecond Vertebra facilitates the Rotation of the firſt. The ſmallneſs of this Apophyſis in the three following Vertebræ, prevents them from compreſſing the neighbouring Parts, when the Neck is bent backwards; and they are broad and forked, to afford ſufficient room for the Inſertion of Muſcles.

527. The Vertebræ of the Back ſerve principally for the Formation of the Cavity of the Thorax, by ſuſtaining the Arches of the Ribs; and this Cavity is augmented by this, that the whole Row of theſe Vertebræ is concave on the foreſide.

528. The length of their ſpinal Apophyſes is proportioned to the great number of Muſcles inſerted in them. The oblique Situation of theſe Apophyſes, and their lying for the moſt part cloſe on one another, not only prevents the Inconveniencies of ſo great a length; but hinders the Vertebræ from being bent backward, and conſequently enables them to ſupport great Weights without ſinking under them.

529. The Curvature of the tranſverſe Apophyſes backward, enlarges the Capacity of the Thorax, and gives to the double Articulation of the Ribs a peculiar ſort of Obliquity, without which it is impoſſible to conceive how by ſimply raiſing the Ribs, all the Dimenſions of the Thorax ſhould be increaſed, and diminiſhed by lowering them.

530. The articular Apophyſes of the Back being almoſt vertical, and nearly in the ſame Plane, ſmall degrees of Flexion and Extenſion are thereby made practicable, as alſo lateral Inflexions; but they cannot allow of any Rotation. As theſe Apophyſes are placed between the tranverſe, and near the

poſterior Extremities of the Ribs; they are very little expoſed to Strains or external Injuries, and thereby their ſmall Size, when compared with the Bodies of the dorſal Vertebræ, becomes ſufficient.

531. The gentle Curvature of the Row of lumbar Vertebræ counterbalances the different Directions of the other Portion of the Spine. The ſhortneſs and ſtraitneſs of their ſpinal Apophyſes gives room to bend the whole Spine backward on the Loins; and their Largeneſs affords ſufficient place for the Inſertion of Muſcles. The length of their tranſverſe Apophyſes facilitates the Action of the Muſcles; but the ſhortneſs of the upper and lower Apophyſes prevents their ſtriking againſt the Ribs, or Oſſa Innominata in lateral Inflexions.

532. The Size of the articular Apophyſes is proportioned to the great Efforts, which they often ſuffer in their Motions. The particular Direction of theſe Apophyſes ſets bounds to the Motions of Rotation, by their meeting and ſtriking againſt each other; and it is principally on this Occaſion that their large Size becomes neceſſary, to enable them to ſuſtain ſuch Strokes without breaking.

533. The Uſe of the Os Sacrum is to ſuſtain the Spine, with all that belongs to it; but in order to this, it was neceſſary that it ſhould be ſtrongly connected with, and encloſed by the Oſſa Innominata, with which it likewiſe ſerves to form the Pelvis; the poſterior part thereof belonging to this Bone. It's lower Extremity is turned very far backward, and thereby the lower part of the Pelvis is enlarged. It's Appendix, the Os Coccygis, ſerves chiefly to ſupport the Inteſtinum Rectum and Anus, as ſhall be ſaid in another Place.

534. Lastly, the whole Canal of the Spine, from the firſt Vertebra of the Neck, to the Extremity of the Os Sacrum, may be looked upon as an articulated Elongation of the Cranium, ſerving to contain a Production of the Brain, called the ſpinal Marrow. This Canal is larger in the Neck and Loins than in the Back. The lateral Holes formed by the Notches in each Vertebra tranſmit the ſame number of Nerves.

### §. 8. *The Bones of the Thorax*; *and firſt, the Ribs.*

535. The Thorax, called commonly the Breaſt, is the firſt and ſuperior proper part of the Trunk. It may be compared to a ſort of Cradle, being compoſed of ſeveral lateral Pieces, termed Ribs, and of one anterior Piece, called Sternum, which, with the twelve Vertebræ of the Back, form the bony Cavity of the Breaſt.

*Figure and general Situation of the Ribs.*

536. The Ribs are bony Arches of different Sizes, ſituated tranſverſely and obliquely on each ſide of the Thorax, and ſo diſpoſed, as that their Extremities are turned toward each other.

*Number and Differences.*

537. They are commonly twenty-four in number; twelve on each ſide. This number varies, ſometimes on one ſide only, ſometimes in both. They are diſtinguiſhed into true and falſe.

538. The ſeven upper Ribs on each ſide go to the Sternum, and thus form intire Arches; for which reaſon they are named true Ribs. The five inferior Ribs do not reach the Sternum, and becauſe they do not form intire Arches, they are termed falſe Ribs.

539. In each Rib we may conſider, in general, the middle Part or Body; *Diviſion.* two Extremities, one anterior, the other poſterior; two Sides, one external and convex, the other internal and concave; two Edges, one ſuperior, the other inferior; and two Labia in each Edge, one external, the other internal. The poſterior Extremity, which may be called the Head of the Rib, is articulated with the Vertebræ of the Back. At the anterior Extremity, freſh Ribs are lengthened out by Cartilaginous Epiphyſes ſtuck into their bony ends. This Production is termed the Cartilage or Cartilaginous Portion of the Rib.

540. Each of the true Ribs, at the poſterior Extremity, hath two ſmall cartilaginous Impreſſions, diſtinguiſhed by a kind of Angle, by which they are articulated with the lateral cartilaginous Impreſſions in the Bodies of two Vertebræ of the Back; but the firſt Rib has no more than one ſuch Impreſſion, being articulated with one Vertebra only.

541. At a ſmall diſtance from the Head of this Extremity, poſteriorly, is another cartilaginous Impreſſion on each ſide, a little convex and cloſely joined to a ſmall Tuberoſity. By theſe the Ribs are articulated with the cartilaginous Depreſſions in the tranſverſe Apophyſes of the dorſal Vertebræ; and the Tuberoſities ſerve for the Inſertion of Ligaments. The Portion which lies between the Head and theſe Impreſſions, is contracted, and repreſents a Neck.

542. When the poſterior Extremity of a Rib is articulated with two Vertebræ, the ſecond Articulation is always with the tranſverſe Proceſs of the loweſt of the two.

543. Between the Tuberoſity and middle part of the Ribs, there is on the outſide of moſt of them, a kind of oblique rough Angle of different Breadths. In the firſt Rib, this Angle is not diſtinct from the Tuberoſity. In the ſecond, it reaches but to a ſmall diſtance from it. In the third Rib, this diſtance is greater, and from thence continues to increaſe gradually all the way to the third falſe Rib; ſo that if we look directly at the Back of a Sceleton, theſe Angles ſeem to repreſent the two Legs of a Pair of Compaſſes opened pretty wide.

544. On the inſide of the Ribs towards the lower Edge, we obſerve a Groove reaching from the Angle, all the way to the Extremity, and that chiefly in the five lower true Ribs, and the firſt three falſe ones. The upper Edge of the two firſt Ribs is ſharp; the lower, a little rounded. The upper Edge of the third is more obtuſe, and the lower more flat. In the reſt, the upper Edge is ſomething rounded, and the lower more or leſs ſharp.

545. These Ribs increaſe in length as they deſcend, and their anterior Extremities on each ſide are at a greater diſtance from one another; ſo that all the Extremities of one ſide, with the Extremities of the other, repreſent, on the forepart of the Breaſt, an Angle almoſt like that which I already

took notice of on the back part. The Extremities of the firſt Ribs on each ſide do not lie in the ſame Line with the reſt, but, being much ſhorter, are ſituated further back. The ſame thing is ſometimes, though very rarely, obſervable in the two ſecond Ribs. There is this likewiſe peculiar to the firſt Rib, that it's Breadth increaſes from behind, forward.

546. In all the Ribs the anterior Extremity is lower than the poſterior. The firſt is but little inclined, the ſecond more, and the Inclination of all the reſt increaſes as they deſcend; their anterior Extremities being proportionably at a greater diſtance from each other than the poſterior, the Spaces between which are every where nearly the ſame.

547. The Ribs are much more crooked in the back than in the forepart. The Curvature of the two firſt Ribs on each ſide lies almoſt in the ſame Plane with the two Extremities of each. This equality begins to be loſt in the third Rib, which is ſomething contorted from the Angle all the way to the anterior Extremity, the lower Edge being turned a little outward, and the Curvature being turned a little upward, about the middle of the Arch, and afterwards a little more downward, from thence to the anterior Extremity. This Contorſion increaſes in the following Ribs, all the way to the third falſe Rib; all which look like a contorted Italick *ſ*, and when laid on an even Table, one Extremity is always turned upward, the other downward.

548. The Appendices, Epiphyſes, or cartilaginous Portions of the true Ribs, increaſe in length, as they deſcend, in the ſame manner as the Ribs themſelves. Each of them, except the firſt, terminates by two little cartilaginous Sides joined together by an Angle, by which they are articulated with the Sternum. The Extremity of the firſt Cartilage is very broad, and cemented to the Sternum by a Symphyſis, like that by which the other end is connected with the bony Extremity of the Rib.

549. The Cartilages of the firſt three or four Ribs lie nearly in the ſame Direction with the Ribs themſelves. In the Ribs below theſe the Cartilages make Angles, at which they turn upward toward the Sternum, and this Curvature increaſes in proportion as the Ribs deſcend. The loweſt Cartilages, in changing their Direction upwards, lie very cloſe to each other, and thoſe of the laſt two true Ribs have often at their inferior Edge a ſort of Apophyſes or Production, by which they are connected with the Cartilages immediately below them.

550. The laſt two true Ribs extend conſiderably in breadth towards their lower ſharp Edges, from the Angle for a good diſtance anteriorly; afterwards they contract in breadth and increaſe in thickneſs, forming a ſort of Neck a little longer than that at their poſterior Extremity; then their breadth begins to increaſe again by degrees all the way to the anterior Extremity. In all the Ribs, this Extremity terminates in a Cavity in which the Cartilages are grafted.

551. The three uppermoſt falſe Ribs increaſe in breadth from the Angle forward, in the ſame manner as already ſaid. The Grooves are in them moſt conſiderable. They have Heads, Necks, Tuberoſities and Angles, almoſt

the ſame as in the laſt true Ribs. Their length diminiſhes by degrees, and their anterior Extremities ſeparating from each other in the ſame manner with thoſe of the true Ribs, lie in the ſame Line with them. The laſt two have only one Impreſſion at their poſterior Extremities, and are without any Tuberoſity. They are both much ſhorter than the reſt, eſpecially the fifth.

552. All the falſe Ribs have cartilaginous Appendices. The firſt is longeſt and fixed to the Cartilage of the laſt true Rib. The two following are united together at their Extremities. The laſt two are connected only to Muſcles and Ligaments. They are both very ſhort, eſpecially the laſt, which is not above a quarter of an Inch in length. All theſe Cartilages of the falſe Ribs are pointed at their Extremities.

*Connexion*

553. The Ribs are articulated anteriorly with the Sternum, and behind with the Vertebræ of the Back. The firſt Rib is intirely united with the Sternum, by means of it's Cartilage; in the ſix following, the Extremities of the Cartilages join that Bone.

554. The three upper falſe Ribs are joined to each other by the Extremities of their Cartilages; and the firſt is likewiſe joined to that of the laſt true Rib. The two laſt have no ſuch Connexion, as has been already ſaid.

555. The Connexion of the Ribs with the Vertebræ of the Back is for the moſt part by a Ginglymus. The firſt Rib on each ſide is articulated by it's Head, with the lateral Impreſſion in the Body of the firſt Vertebra, and by it's Tuberoſity, with the ſmall Cavity in the tranſverſe Apophyſis of the ſame Vertebra.

556. The Head of the ſecond Rib is articulated by it's Head with the Impreſſions in the lower part of the Body of the firſt Vertebra, and in the upper part of the Body of the ſecond; and by it's Tuberoſity, with the articular Cavity in the tranſverſe Apophyſis of the ſecond Vertebra.

557. All the other Ribs, except the two laſt of the falſe Ribs, are articulated in the ſame manner; that is, by their Heads, with the Impreſſions on the Bodies of two Vertebræ next each other, and by their Tuberoſities, with the tranſverſe Apophyſis of the loweſt of each two Vertebræ. The eleventh and twelfth Ribs are commonly articulated by their Heads only, with the Impreſſion in the Body of one Vertebra.

558. From what has been ſaid, it is evident, that the ten upper Ribs are confined to two Motions, one upward, the other downward; whereas the two laſt are left more at liberty, and are therefore termed floating Ribs.

*Uſes.*

559. The Ribs joined to the Vertebræ of the Back and Sternum form a Cavity, capable of Expanſion and Contraction, in which are contained chiefly the Organs of Reſpiration and thoſe of the Circulation of the Blood. The Mechaniſm of their Structure ſhall be ſpoken to hereafter.

## §. 9. *The Sternum.*

*Situation in general.*

560. The Sternum is ſituated lengthwiſe in the anterior part of the Thorax.

*Figure.* 561. It is a long flat Bone, not all of the ſame breadth, repreſenting a ſort of Dagger.

*Diviſion.* 562. It is generally made up of three principal Pieces, the firſt broad and ſhort; the ſecond longer and narrower; the third a ſort of ſmall Appendix, called by the *Greeks* Xiphoides, from it's reſemblance to the Point of a broad Sword.

*The firſt Piece.* 563. The firſt or uppermoſt Piece is broad and thick at the top, but thinner and narrower below, being nearly of the figure of a Triangle with the three Angles cut off, or of an irregular Square. We diſtinguiſh in it two Sides, one external or anterior, the other internal or poſterior; four Edges, one ſuperior, two lateral, and one inferior; and four imperfect Angles, two ſuperior, and two inferior.

564. The anterior or outſide is unequally convex, the poſterior or inner ſide a little concave.

565. The upper Edge is the thickeſt, with a large ſmooth Notch or Slope in the middle, called by the Ancients the Furca. The two ſuperior Angles are two large thick articular Notches, ſituated obliquely on each ſide of the Furca. The lateral Edges are thin and oblique, and in each of them we ſee an oblong cartilaginous Mark, which belongs to the Cartilage of the firſt true Rib. The two inferior Angles are two articular Half-notches, which receive the Cartilage of the ſecond Rib. The lower Edge is ſmaller and thicker than the others, being joined by Symphyſis to the ſecond Piece.

*The ſecond Piece.* 566. The ſecond Piece of the Sternum is much longer than the firſt. It is flat on both ſides, and broader towards the lower than towards the upper Part. We obſerve in it ſometimes, eſpecially on the fore ſide, ſeveral tranſverſe Lines, which point out the places where the Pieces of which it is made up in Children are united together. Both ſides are flat, but depreſſed more or leſs, through the middle of their whole length. The upper Edge is ſmall, being proportioned to the lower Edge of the firſt Piece with which it is connected by a cartilaginous Symphyſis. The lower Edge is ſtill ſmaller, appearing like a truncated Angle.

567. The two lateral or greateſt Edges have each a cartilaginous Half-notch, and five cartilaginous intire Notches. The Half-notches are at the upper Part of the lateral Edges, where they meet the Half-notches in the firſt Piece. The five intire Notches come nearer to each other in proportion as they are lower, and part of the laſt belongs often to the third Piece.

*The third Piece.* 568. The third Piece, called commonly Cartilago Xiphoides, or Enſiformis, and in *French* by a word which ſignifies the Briſket, is intirely cartilaginous in young Subjects, but in an advanced Age it generally oſſifies either wholly, or in part, in ſome Subjects later than in others; it would therefore be more properly named Appendix Xiphoides, or Enſi formis.

569. This Piece is joined to the lower Extremity of the ſecond, between the Cartilages of the laſt true Ribs; and it is often more or leſs notched on each ſide, to form part of the laſt articular Notches of the Sternum.

It's Figure is nearly that of the Point of a broad Sword, from whence it has it's Name both in *Greek* and *Latin*; but neither it's Figure nor Size are conſtant. In ſome Subjects it is forked, in ſome perforated. Sometimes it is very large, ſometimes very ſmall, hardly exceeding the third part of an Inch.

*Subſtance.*

570. The inner Subſtance of the Sternum is almoſt all cellulous, and very ſlender, and covered on the outſide with a thin compact Lamina.

*Uſes.*

571. The Sternum completes the fore part of the Cavity of the Thorax, and ſuſtains the anterior Extremities of the Ribs, being ſufficiently fixed to reſiſt Compreſſions, and other outward Accidents; and yet moveable enough by means of it's articulation with the Cartilages of the Ribs, not to obſtruct the Motions neceſſary for Reſpiration. It likewiſe ſerves for the inſertion of ſeveral Muſcles, and to ſupport the Mediaſtinum, &c.

## §. 10. *The Bones of the Pelvis; and firſt, the Oſſa Ilium.*

*Situation of the Pelvis in general.*

572. The Pelvis is the third and loweſt part of the Trunk, conſiſting chiefly of two large Pieces, called Oſſa Innominata, which being united anteriorly by a cartilaginous Symphyſis, and poſteriorly to the two Sides of the Os Sacrum, repreſent a kind of Baſon. When conſidered ſeparately, they have no regular Figure, being of different breadths in different Parts, unequally convex on the outſide, and unequally concave on the inſide.

*General Diviſion.*

573. Each Bone is but one Piece in adult Subjects, but in Children it conſiſts of three Pieces, joined together by a Cartilage, which afterwards perfectly oſſifies, leaving commonly no Veſtige of the firſt Diviſion. Anatomiſts, however, conſider in it, even in Adults, three different Portions, and diſtinguiſh them by different Names, as if they were three diſtinct Bones.

574. Of theſe three Portions, the largeſt is ſuperior and poſterior, called Os Ilium; the ſecond inferior, called Os Iſchium; and the third and ſmalleſt anterior, called Os Pubis.

575. Before we treat of each of theſe Portions ſeparately, it muſt be obſerved, that in the intire Bone there are ſeveral common Parts, or which belong to more Portions than one, *viz.* a deep cartilaginous Cotyloide Cavity, called in *Latin* Acetabulum, formed by all the three Portions; a large Opening, called Foramen Ovale, formed by the Os Iſchium and Os Pubis; a large poſterior Notch or Sinus, called the Iſchiatic Notch, formed by the Os Ilium and Os Iſchium; an oblique Eminence or Protuberance above the Acetabulum towards the Foramen Ovale, made by the Os Ilium and Os Pubis. To theſe may be added a Ridge on the inſide of the Pelvis, which divides the upper wide part from the bottom, to which alone the Ancients gave the Name of Pelvis.

576. The Os Ilium was ſo named by the Ancients, becauſe it ſupports the parts called by them Ilia.

*Size and Figure of the Os Ilium.*

577. This Bone is the largeſt of the three. It is flat, very broad, unequally convex and concave, partly round and partly of an irregular ſquare Figure.

*Diviſion.* 578. It is divided commodiouſly enough into the Criſta, Baſis, anterior and poſterior Edge, and two Sides, one external, the other internal.

579. The Criſta is the upper part, being a pretty thick arched Border, the Circumference of which is a little more than a Quadrant of a Circle. The anterior and middle part is convex outward, the poſterior part a little convex inward. We diſtinguiſh in it two Labia and a middle Space or Interſtice between them. It is originally an Epiphyſis, of which we ſometimes ſee plain Marks in a very advanced Age.

580. The poſterior portion of the Criſta, which is convex inward, is much thicker than the anterior, and for that reaſon might be called the Tuberculum of the Criſta. The whole Criſta appears to be cruſted over with a Cartilage, which in reality is no more than the dried tendinous Inſertions of the Muſcles.

581. The anterior Edge of the Os Ilium has two Eminences or Tubercles, called the anterior Spines; one ſuperior, the other inferior; and likewiſe two Notches, one between the Spines, the other below the inferior Spine.

582. The poſterior Edge is ſhorter and thicker than the anterior. It terminates likewiſe in two Eminences or Spines, between which there is a conſiderable Notch.

583. The Baſis or inferior part of this Bone is the thickeſt and narroweſt of all. It forms anteriorly a Portion of the Acetabulum, and poſteriorly, almoſt all the Iſchiatic Sinus.

584. The outſide is convex on the fore part, and concave on the back part. We obſerve on it the remains of a long ſemicircular Line which reaches from the upper anterior Spine, to the great Iſchiatic Sinus, being a Muſcular Mark. Above and behind this Semicircle there are ſeveral other Impreſſions and Muſcular Marks. A little above the Edge of the Acetabulum we ſee likewiſe many Inequalities which ſurround part of that Edge in a ſemicircular Form, being a Collection of Muſcular and Ligamentary Marks.

585. The inſide is unequally concave, and has ſeveral Inequalities toward the back part, the chief of which is, that large Cartilaginous Surface of the Figure of an S, or of a Bird's Head, which anſwers to the lateral Surface of the Os Sacrum, with which it is connected by a Cartilaginous Symphyſis. The other Inequalities are much of the ſame kind with thoſe in the lateral part of the Os Sacrum, with which they form ſeveral rough and irregular Cavities. From the upper part of the Cartilaginous Surface or Symphyſis, all the way to the oblique Eminence, runs a prominent Line which bounds the Concavity of the inſide of this Bone, and diſtinguiſhes the Margin of the Pelvis from the bottom.

## §. 11. *Oſſa Iſchium.*

586. The Os Iſchium is the loweſt Portion of the Os Innominatum, as well as of the whole Trunk. It is divided into the Body, Tuberoſity, and Ramus or Branch. *Situation in general and Diviſion.*

587. The Body of the Os Iſchium forms the loweſt and greateſt part of the Acetabulum, and ſends out an Apophyſis backward, called the Spine of the Iſchium.

588. The Tuberoſity is very thick, unequal, and turned downward; and it is on this part that the whole Body reſts, when we ſit. It appears Cartilaginous, becauſe of the dried and hardened Remains of the Tendons. The whole convex Portion of it is originally an Epiphyſis, of which the Marks are obliterated ſooner in ſome Subjects than in others. Three Muſcular Impreſſions may be diſtinguiſhed in it.

589. The Branch of the Iſchium is a kind of ſmall, flat, thin Production or Apophyſis, which aſcends forward from the Curvature of the Tuberoſity to the Os Pubis; and it is often covered in part by a continuation of the Epiphyſes of the Tuberoſity.

590. These three parts of the Iſchium taken together form a large Opening which makes the greateſt part of the Foramen Ovale. Three other Notches are remarkable upon this Bone; one poſterior between the Tuberoſity and the Spine, for the paſſage of the internal Obturator Muſcle, which is a little Cartilaginous, and divided into three or four ſmall ſuperficial Channels: one lateral between the Tuberoſity and the Acetabulum, for the paſſage of the external Obturator Muſcle; and one anterior at the Edge of the Acetabulum, for Ligaments, &c.

## §. 12. *Oſſa Pubis, and Acetabulum.*

591. The Os Pubis is the leaſt of the three Portions of the Os Innominatum. The two together form the fore part of the Pelvis; and in each we may diſtinguiſh the Body, Angle, and Branch. *Situation in general and Diviſion.*

592. The Body of the Os Pubis is it's upper part, ſituated tranſverſely before the inferior part of the Os Ilium. It's poſterior Extremity is very thick, and by it's union with the Os Ilium forms the oblique Eminence which diſtinguiſhes theſe two Portions of the Oſſa Innominata. It likewiſe contributes to the formation of the Cotyloide Cavity. It's anterior Extremity ends in a ſmall Eminence or Tuberoſity, called the Spine of the Os Pubis, which is ſometimes double.

593. The upper Edge has on it's inner part an oblique Ridge, which may be called the Criſta of the Os Pubis, and is continuous with that Ridge which diſtinguiſhes the margin and bottom of the Pelvis. Before this Criſta is a broad oblong oblique ſlope. The lower Edge is obliquely notched, and forms the upper part of the Foramen Ovale.

594. The Angle of the Os Pubis is it's anterior Portion, and makes part of that Connexion called the Symphyſis of the Oſſa Pubis. This Portion is flat, and not very thick; and in ſome Subjects, toward the upper part of the fore-ſide, near the angular Curvature, it has an Eminence which increaſes the ſize and extent of the Spine already mentioned. The two Oſſa Pubis, connected together by this Portion, form on the fore-ſide an unequal Convexity, but on the back-ſide a pretty even Concavity.

595. The Branch of the Os Pubis is a flat thin Apophyſis, which running downward unites with the Branch of the Iſchium by a Cartilaginous Symphyſis, of which only ſome Marks remain in Adults. It completes the Formation of the Foramen Ovale. The Branches of the two Oſſa Pubis form on the fore-ſide a pointed Arch, which in the natural State is much more round.

*Acetabulum.* 596. Besides what has been ſaid of the Acetabulum in general, there are other particulars obſervable about it, which could not well be mentioned till after the Deſcription of the three Portions of which it is made up. Theſe are the Edge called Supercilium, the Cartilaginous Cavity, the Impreſſion at the bottom of the Cavity, and the Notch in the Edge.

597. The Edge or Supercilium is very prominent on the upper part; on the ſides this Prominence decreaſes as they deſcend, and between the anterior and inferior part it is quite loſt. In the natural ſtate it is increaſed by an additional Elaſtic Circle, which ſhall be deſcribed in the Treatiſe of freſh Bones.

598. The Cavity is proportionable to the Prominence of the Edge, and conſequently deeper on the upper and back part than on the lower and fore part. It is covered with a very ſmooth Cartilage except from the middle to the Notch.

599. This Portion of the Cavity which is without Cartilage, is what I called the unequal Impreſſion, which is broader toward the bottom of the Cavity than toward the Edge, and ſerves to contain a Ligament and a bundle of Glands.

600. The Notch is preciſely between the anterior and inferior Portion of the Edge of the Cavity, near the Foramen Ovale, which it, in a manner, unites with the Cavity. The Situation of this Notch is oblique with reſpect to the direction of the whole Body in an erect Poſture.

*Subſtance of the Os Innominatum.* 601. The Subſtance of all the three Portions is moſtly ſpungy, except in the middle of the Os Ilium, where the two Tables uniting, render the Bone tranſparent; and the ſame is to be ſaid of the Acetabulum.

*Connexion.* 602. The Oſſa Innominata are joined to the Os Sacrum, and to each other by a Cartilaginous Symphyſis. They are articulated with the Os Femoris by Enarthroſis, as we ſhall ſee in deſcribing that Bone.

*Uſes.* 603. The Oſſa Innominata, together with the Os Sacrum, form the Pelvis which is part of the Cavity of the Abdomen, and ſupports ſeveral Viſcera, eſpecially thoſe which are the Common-Sewers of the Urine and groſs Excrements, and thoſe by which the two Sexes are diſtinguiſhed. The Pelvis is larger in Women than in Men; the Oſſa Ilium and Iſchium are wider.

The Arch formed by the Branches of the Oſſa Pubis is likewiſe greateſt in Females.

604. Moreover, theſe Bones, together with the Os Sacrum, ſupport the whole Trunk and all the parts belonging to it, and alſo the lower Extremities. In a word, they are the Baſis of the whole Body of Man, and the general Center of all it's Motions, when ſtanding, ſitting, or lying.

## ART. IV.

### *The Bones of the upper Extremities.*

605. THE upper Extremities of the human Body are two in number; fixed to the upper and lateral parts of the Trunk, from whence they may be extended below the inferior part thereof, that is, below the Pelvis. Each of them is divided into four Parts, the Shoulder, the Arm, the Fore-Arm, and the Hand.

### §. 1. *The Bones of the Shoulder; and firſt, the Scapula.*

606. The Shoulder is made up of two Bones, one large and poſterior, called the Scapula, the other ſmall and anterior, named the Clavicle.

*Situation in particular, and Figure of the Scapula.*

607. The Scapula is a large Bone, in ſome meaſure of a triangular figure, ſituated laterally at the upper and poſterior part of the Thorax, from about the firſt Rib down to the ſeventh.

*Diviſion.*

608. It may be divided into two Sides, one external or poſterior and convex, the other internal or anterior and concave; three Edges, one named the Baſis, and two named Coſtæ, one ſuperior, the other inferior; three Angles, one anterior, called the Head or Neck, one ſuperior, and one inferior. I ſhall begin with the Edges, and end with the Sides.

609. The Baſis is the longeſt Edge of the Scapula. It is commonly ſituated on one ſide of the Spine, a little obliquely, the upper Part of it being nearer the Vertebræ than the lower. It is, as it were, divided into two Parts by a very obtuſe Angle, which diſtinguſhes the ſuperior Quarter from the three other Quarters. It is conſiderably thick, and is accordingly divided into two Labia, one exterior the other interior. It continues to be an Epiphyſis in many adult Subjects, towards both it's Extremities, eſpecially towards the lower.

610. The ſuperior Coſta is the ſhorteſt and thinneſt of the three Edges. It is ſituated almoſt tranſverſely between the ſuperior Point of the Baſis and Neck of the Scapula, being a little more raiſed toward the Baſis than at the other end, where it often terminates by a ſmall Notch. It is divided into an external and internal Labium.

611. The inferior Coſta is of a middle length between the other two Edges. It's Situation is very oblique between the inferior Point of the Baſis and Neck of the Scapula. It is thicker than the reſt, and often appears to be double, having two very diſtinct Labia, the outermoſt of which is

thin, the other round. Theſe two Labia are ſeparated by a kind of Channel, or Groove; and upon the external Labium is a narrow Impreſſion, which runs from the Neck through two thirds of the length of the Coſta.

612. The Neck of the Scapula is the biggeſt of the three Angles. It ought more juſtly to be called a Head with a very ſhort Neck; and a ſuperficial or glenoide Cavity in the top of it, which is lined with a Cartilage and of an Oval Figure, but pointed at the upper Part, and rounded at the lower; and deeper in the natural State than in the Sceleton, as will be ſeen in the Hiſtory of freſh Bones. In the natural Situation of the Scapula this Cavity is turned obliquely forward, and not directly outward. Between the Edge of this Cavity and the contracted part which is the true Neck, ſome Inequalities are obſervable, which are the remains of the Symphyſis of Oſſification.

613. At the upper part of the Neck there is a Production or Epiphyſis reſembling a crooked Finger or Crow's Bill, called the Coracoide Apophyſis or Epiphyſis, which at it's Origin has a Tuberoſity, for the Inſertion of the Ligaments of the Clavicle. It terminates by three Muſcular Impreſſions, which all together form an obtuſe Point.

614. The Angles next the Baſis have nothing very remarkable, only that the ſuperior is more acute than the inferior in ſome Subjects.

615. The Outſide of this Bone is unequally convex, and a little below the ſuperior Coſta, ſhews a long, high, thin Eminence, called the Spine of the Scapula, which riſes gradually higher from the Curvature or obtuſe Angle at the Baſis all the way to the Neck, and afterwards turns upwards and forward over the Coracoide Apophyſis, forming another broad Apophyſis called the Acromium. The name of Criſta is given to the Edge of this Spine.

616. This Criſta is extended in breadth in three particular places. The firſt is near the Baſis of the Scapula, where there is a ſmooth triangular Surface. The ſecond is a kind of oblong, flat and rough Tuberoſity. The third is at the Acromium, of which already. On the anterior Edge of this Apophyſis near it's Point, is a ſmall Cartilaginous Apophyſis for the Articulation of the Scapula with the Clavicle.

617. The Body of the Spine divides the outſide of the Scapula in two Portions, the uppermoſt and leaſt of which is termed Foſſa Supra-ſpinalis, the loweſt and largeſt, Foſſa Sub-ſpinalis, in which we obſerve a long Depreſſion, lying a little above the Coſta Inferior, and running from the inferior Angle, to the Neck. Near this inferior Angle we ſee likewiſe a kind of ſmall diſtinct Surface unequally triangular and oblong, which runs up upon the inferior Coſta toward the Channel or Groove in it's external Labium.

618. The inſide of the Scapula is irregularly concave, chiefly toward the upper part, and, in a manner, divided into ſeveral ſuperficial and longitudinal Foſſulæ, by little Ridges which run like Radii from the Neck

toward the Baſis. The direction of theſe Lines is tranſverſe with reſpect to that of the Ribs.

619. Besides theſe parts, we obſerve likewiſe three Notches; one very large, between the Neck and the Spine; one ſmall, between the ſuperior Coſta and the Coracoide Apophyſis; and one of a middle ſize, between that Apophyſis and the Glenoide Cavity. There is ſometimes a particular Hole which either perforates the Baſis of the Spine at it's middle, or is there loſt in the Subſtance of the Bone.

620. We muſt not forget here, two ſmall rough Marks or Impreſſions immediately above and below the Glenoide Cavity; the loweſt of which extends itſelf a little over the neighbouring Coſta. They might be termed Muſcular Impreſſions of the Neck of the Scapula.

*Subſtance.* 621. In the Neck, Spine, Baſis, inferior Coſta, and Coracoide Proceſs, there is a Diploë; the reſt of the Bone is tranſparent, thin, and almoſt without any middle cellulous Subſtance.

*Connexion and Uſes.* 622. The Scapula is articulated with the Cavity, by the Acromium, and with the Os Humeri, by the Glenoide Cavity. It is likewiſe joined to the Trunk by a fleſhy Symphyſis or Syſſarcoſis. It ſerves to facilitate the Motions of the Arm, to give Inſertion to a great many Muſcles, and as a Shield, to defend the back parts of the Thorax.

## §. 2. *Clavicula.*

*Situation in general.* 623. The two Clavicles are ſituated tranſverſely and a little obliquely, oppoſite to each other, at the ſuperior and anterior part of the Thorax, between the Scapula and the Sternum.

*Figure.* 624. Each Clavicle reſembles in ſome meaſure an *Italick ſ*, being a long Bone, irregularly Cylindrical, bent forwards near the Sternum, and backward near the Scapula, as if it were made up of two Arches joined endwiſe in oppoſite Directions, that which lies on the fore part of the Breaſt being the largeſt. The Clavicles are ſtraiter in Women than in Men.

*Diviſion.* 625. The Clavicle is divided into a Body or middle Part, and two Extremities, one anterior, inferior, and internal, which I term the Pectoral or Sternal Extremity; the other poſterior, ſuperior, and external, which I name the Humeral or Scapular Extremity.

626. The Pectoral Extremity is the thickeſt, and of a triangular Figure, eſpecially near the end, where it is a little enlarged, and ſhews a Cartilaginous Surface with three Angles, of which the loweſt is the moſt prominent, and turned a little toward the Cavity of the Thorax. Near theſe Angles there are ſeveral Muſcular and Ligamentary Impreſſions, one of which near the inferior Angle is ſometimes raiſed like a Tubercle.

627. The Humeral Extremity is flat and broad, and two Sides may be conſidered in it, one ſuperior, the other inferior; likewiſe two Edges, one anterior, the other poſterior; and a ſmall articular Surface.

628. The upper ſide has ſeveral Inequalities, and in the lower there is a kind of oblong rough oblique Tuberoſity. The poſterior Edge is convex, thick, and uneven, being that of the ſmall Arch of the Clavicle. The anterior Edge is concave, narrow, and ſmooth every where, except near the great Arch where it has a rough Impreſſion. The articular Surface terminates this Extremity, being Cartilaginous, turned obliquely forward, and of an oval Figure, like that of the Acromium, with which it is articulated.

629. The Body or middle Portion, which together with the pectoral Extremity, forms the great Curvature of the Clavicle, is not ſo thick as the Extremities. It is a little flatted, both on the upper and lower Sides, and therefore two Edges may likewiſe be diſtinguiſhed in it. The upper Side is pretty even, the lower ſomething rougher, and a little depreſſed by a ſuperficial Channel. The Edges are rounded, the anterior being Convex, the poſterior Concave.

*Subſtance.* 630. The inner Subſtance of the Extremities is cellulous. The reſt is more ſolid, conſiſting of very thick Sides, with a narrow Cavity more or leſs filled with reticular bony Filaments.

*Situation in particular.* 631. The particular Situation of this Bone is eaſily underſtood from what has been ſaid. The moſt uneven ſide of the Body, and rough ſide of the humeral Extremity, are always to be turned downward.

*Connexion.* 632. The Clavicle is articulated with the Acromium and Sternum by *Arthrodia.* The Articulation with the Scapula, by means of the Acromium, is as real and diſtinct as the Articulation with the Sternum; which laſt appears ſomething extraordinary in the Sceleton, where the ſmall Notch in the Sternum is no ways proportioned to the broad Extremity of the Clavicle. In the Deſcription of the freſh Bones, I ſhall ſhew how this is to be accounted for; and likewiſe demonſtrate the ligamentary Connexions.

*Uſe.* 633. The Clavicles ſerve for Buttreſſes to the Scapulæ, and bound their Motions forward, and upward; by their ligamentary Connexions they likewiſe hinder the Scapulæ from running too far back; which might happen in thoſe who drag Burdens behind them, *&c.* They alſo give Inſertion to many Muſcles.

## §. 3. *Os Humeri.*

*Situation in general, Size and Figure.* 634. The Os Humeri or Bone of the Arm is both longer and thicker than any other Bone of the upper Extremity. It is ſituated under the Acromium, along the lateral part of the Thorax, from which however it may be removed to a conſiderable diſtance, in all Directions. It's Figure is irregularly Cylindrical, and it is thick at one end and broad at the other.

*Diviſion.* 635. It is divided into the Body, and two Extremities, or into an upper, middle and lower part.

636. The upper part is generally called the Head of the Os Humeri, and the part immediately below that, is called the Neck.

637. In the Head, we conſider a Half-Globe obliquely inclined, cruſted over with a ſmooth Cartilage: two Tuberoſities, one large, terminating upward in a Point, over-againſt the Half-Globe; the other ſmall, placed laterally between the large one and the Half-Globe: a Channel or Groove between the two Tuberoſities: four muſcular Impreſſions, three of which are on the large Tuberoſity, one in the Apex, one on the ſide oppoſite to the Groove, and the third lower down on the ſame ſide over-againſt the ſmall Tuberoſity upon which the fourth is found. Of theſe four Impreſſions, that on the ſmall Tuberoſity, and the ſecond of the other three, are the largeſt. All theſe parts of the Head of the Os Humeri are one Epiphyſis in Children, of which very plain Marks remain ſometimes in an advanced Age.

638. The Channel or Groove between the two Tuberoſities is continued downwards in an oblique Direction through one quarter of the length of the Bone, and there becoming rough, it forms a muſcular Impreſſion not always equally ſenſible. The Edges of this Channel are two Ridges or prominent Lines continued down, as it were, from the two Tuberoſities. That from the great Tuberoſity is the moſt conſiderable, and is continued down to the middle of the Bone, where it is loſt in a long, broad, raiſed muſcular Impreſſion more or leſs rough. The other which comes from the ſmall Tuberoſity is leſs prominent and ſhorter. At the ſide of this Ridge, toward the lower part, are two other narrow longitudinal and ſuperficial muſcular Marks one above the other, the lower Extremity of the firſt reaching down on the foreſide of the upper Extremity of the ſecond.

639. The middle Part or Body of the Os Humeri comes nearer to a cylindrical Figure than the Extremities. It is a little raiſed at the rough Eminence or Impreſſion already mentioned. On each ſide of this Eminence is another muſcular Impreſſion, which uniting immediately below it, it appears to be incloſed between them as between the two Prongs of a Fork. On that ſide which anſwers to the middle of the Half-Globe, we ſee likewiſe a longitudinal muſcular Mark, and about the middle of that ſide which is even with the great Tuberoſity, there is an oblique hollow turning, of a conſiderable length and breadth, which running down by the ſide of the forked Impreſſion, makes this part of the Bone appear contorted.

640. The lower Extremity of the Os Humeri is triangular from it's very beginning, and from thence grows very broad and flat, being bent a little near the End, towards that ſide which anſwers to the ſmall Tuberoſity in the upper Extremity. It is divided into three Sides, two anterior, and one poſterior, which is the broadeſt; and into three Angles, one anterior, and two lateral.

641. At the end of this broad Extremity are two Tuberoſities, one ſhort and prominent, anſwering directly to the middle of the Half-Globe, the other oblong, rough, and reſembling a Criſta, which anſwers to the Apex of the great Tuberoſity of the Head. The ſhort Tuberoſity is called the internal Condyle, the other the external Condyle.

642. Between theſe two Condyles, on the very loweſt part of the concave ſide of this Extremity, are two articular Eminences, one double, like a

Pulley, next the ſhort Condyle, the other rounded like a ſmall Head, next the long Condyle. The Pulley has a great and ſmall Edge with a Depreſſion between them. The ſmall Edge is loſt in the round Eminence or Head, the great one is gradually widened, and ends in a ſharp Circumference. This Pulley is ſituated obliquely, for on the concave ſide it approaches toward the ſhort Condyle, and on the other, it is turned from it.

643. THREE Foſſulæ are likewiſe obſervable in this lower part of the Bone, two anterior, one immediately above the Pulley, the other above the ſmall Head; and one poſterior, which is very large, and ſituated likewiſe immediately above the Pulley. In Children, the Pulley, the ſmall Head, and the ſhort Condyle are Epiphyſes.

*Subſtance.*

644. THE outer Subſtance of this Bone is compact, eſpecially in the middle Part, within which there is a large tubular Cavity, containing a reticular Texture of bony Filaments. The outſides of the Extremities are leſs ſolid, and their inner Subſtance is cellulous.

*Situation in particular.*

645. THE particular Situation of this Bone deſerves well to be conſidered, becauſe we are often miſled in forming an Idea of it, by viewing the Bone itſelf ſeparated from the Trunk of the Body, by the Figures which have been given of it, and by the undue Application of the Terms External, Internal, Anterior and Poſterior, to the different Parts thereof; which Miſtakes may be of very bad Conſequence in many chirurgical Caſes.

646. WHEN we examine the Os Humeri, as lying along either ſide of the Trunk, in it's natural Situation; the Head will be found ſo diſpoſed as that the Half-Globe is turned inward and backward, anſwering to the Situation of the Glenoide Cavity of the Scapula; the great Tuberoſity outward and forward; the Channel between the two Tuberoſities, almoſt directly forward; the long Condyle, ſaid commonly to be external, turned as much forward as outward; and the ſhort Condyle called the Internal, turned as much backward as inward.

*Connexion.*

647. THIS Bone is articulated above with the Glenoide Cavity of the Scapula, by *Enarthrodia*, which is much plainer in the freſh Bones than in the Sceleton; and below, with the two Bones of the Fore-Arm, in the manner hereafter to be deſcribed.

*Uſes.*

648. THE Uſes of this Bone are generally well enough known. The Explication of all it's different Motions preſuppoſes the Knowledge of the freſh Bones, and of their Ligaments and Muſcles; and therefore muſt be referred to another Place.

## §. 1. *The Bones of the Fore-Arm; and firſt, the Ulna.*

649. THE Fore-Arm is made up of two long Bones, whereof one is named Cubitus or Ulna, the other Radius.

*Figure and Diviſion of the Ulna.*

650. THE Ulna is irregularly triangular, diminiſhing in thickneſs from one end to the other. It may be divided into the Body or middle Part, and two Extremities, one great, the other ſmall.

651. In the great Extremity we obſerve two Eminences, one large, called Olecranum or Ancon, the other ſmall, called Corone or the coronoide Apophyſis; and two Semilunar or Sigmoide Cavities, one great, the other ſmall.

652. The Olecranum is a large Apophyſis ending in a rough Tuberoſity and an obtuſe Point. The Tuberoſity makes the Corner of the Elbow; the Point is lodged in the poſterior Cavity of the lower Extremity of the Os Humeri, when the Fore-Arm is extended. Next under the Tuberoſity is a flattiſh, oblong, triangular Surface, on the outſide of which is another of the ſame kind, but longer and a little hollow, together with a muſcular Foſſula.

653. The coronoide Apophyſis is prominent and a little pointed, reſembling a broad ſhort Beak. It is received into the anterior Cavity above the Pulley, at the lower Extremity of the Os Humeri, when the Fore-Arm is bent.

654. The great Sigmoide Cavity lies directly between theſe two Eminences, reaching from the Point of one to the Point of the other. It is articular, covered with a ſmooth Cartilage, and divided through it's whole length by a middle angular Line; being thus ſuited exactly to the Pulley of the Os Humeri upon which it moves obliquely; theſe two together making a moſt perfect Ginglymus, as well in reſpect of their Structure as of their Uſe. The Half-Cavities on each ſide the angular Line are alſo divided tranſverſely by another Line a little hollow, which terminates at the middle of each Edge of the Cavity, by a very ſmall Notch.

655. The ſmall Sigmoide Cavity, which may likewiſe be termed tranſverſe or lateral, is a ſort of tranſverſe Notch in the inferior Portion of one Edge of the great Sigmoide Cavity, at the ſide of the coronoide Point, directly oppoſite to the muſcular Foſſula already mentioned. It is covered with a Cartilage as well as the great one, of which it appears to be a true Continuation, and it belongs to the Articulation of the Radius. Near this Cavity, directly under the coronoide Apophyſis, there is a very rough muſcular Impreſſion, ſometimes raiſed like a Tuberoſity.

656. This upper Extremity is oblique, and it's Obliquity anſwers to that of the Pulley in the Os Humeri.

657 The ſmall Extremity is Cylindrical, of a leſs Diameter than any other part of the Bone. It may be reckoned a kind of Neck ending in an inverted Head, flat at top, and of a Cylindrical Circumference, both which are covered with the ſame ſmooth Cartilage, and the Circumference is broader on the ſide of the coronoide Apophyſis, and ſmall ſigmoide Cavity, than any where elſe. From the Head runs down a ſhort ſtyloide Apophyſis, on the ſide of the Tuberoſity of the Olecranum, diſtinguiſhed from the reſt of the Circumference by a ſmall Notch.

658. The middle Portion or Body of the Ulna is divided into three Sides, and three Angles. One of the Sides is narrow and rounded, one broad and hollow, and the third flat, and marked with an oblique Line on it's upper Part. The narrow Side anſwers to the Tuberoſity of the Olecranum, and is covered only by the common Integuments. The other two Sides are diſtinguiſhed from the former by two blunt Angles; and they unite at a ſharp

Angle which lies oppoſite to the rounded Side, and anſwers to the Point of the Coronoide Apophyſis. The hollow Side is even with the ſmall ſigmoide Cavity, and the flat Side oppoſite to it. Theſe two Sides give Inſertion to many Muſcles, and the ſharp Angle, to what is called the Interoſſeus Ligament. At the top of this Angle there is a narrow oblong Muſcular Impreſſion. The Angle common to the rounded and flat Sides, ends below in an oblong uneven Muſcular Eminence.

*Subſtance.* 659. The Subſtance of the Ulna is much the ſame with that of the Os Humeri, already deſcribed. The Tuberoſity of the Olecranum, and the ſmall inferior Head, with it's Styloide Apophyſis, remain for a long time Epiphyſes in ſome Subjects.

*Connexion.* 660. It is connected with the Pulley of the Os Humeri, by an angular Ginglymus; with the two Extremities of the Radius, by a compound lateral Ginglymus, and with the Hand by Ligament, and not by Articulation.

*Situation in particular.* 661. The Situation of this Bone may be conſiderable two ways, either when the Fore-Arm is extended and lies along the ſide of the Trunk, or when it is bent, and lies on the lower Part of the Breaſt. The firſt Situation appears to be moſt commodious for determining what parts of the Bone are to be called anterior, poſterior, ſuperior, inferior, external, and internal. But the ſecond ſeems moſt natural, as being the moſt common in living Bodies, whether ſitting or ſtanding, and has accordingly been followed by ſome of the Ancients. I ſhall have occaſion to ſay ſomething more upon this Head, in deſcribing the Radius and Bones of the Hand.

## §. 5. *The Radius.*

*Size, Figure, and Situation in general.* 662. The Radius is nearly of the ſame length with the Ulna, bigger at one end than at the other, irregularly triangular, a little bent, and ſituated along the ſide of the Ulna. It's name is taken from the reſemblance it bears to the Spoke of a Wheel.

663. We are to conſider in this Bone two Extremities, and a middle Portion. One Extremity is ſmall, and like a kind of Head ſet upon a Neck, the other is large, reſembling a Pedeſtal or Baſis; and therefore it might be divided in a Head, Body and Baſis.

*Diviſion.* 664. The Head or ſmall Extremity of the Radius is very ſhort or low, the Top of it is concave, and the Circumference Cylindrical; and both the Glenoide Cavity and Circumference are covered with the ſame ſmooth ſhining Cartilaginous Cruſt; and about one quarter of the Circumference is broader than the reſt. The Neck is ſmall, and it's Situation a little oblique. It ends by a lateral Tuberoſity which lies directly under the broad part of the Head, being rough in the middle and on one ſide, and ſmooth and ſuperficially Cartilaginous on the other.

665. The Baſis or great Extremity of the Radius is much broader than it is thick, and has two broad ſides and one narrow. One of the broad ſides is a little hollow and pretty even; the other is unequally convex,

and divided by longitudinal Eminences, or bony Lines, into three or four longitudinal Channels, much more diſtinct in freſh Bones than in the Sceleton. The narrow Side is hollowed lengthwiſe, and between it and the other two, two Angles are formed, by which the three Sides are diſtinguiſhed, and oppoſite to it, the other two meet in a third Angle. This narrow Side ends in a ſemilunar Cavity bordered with a ſmooth Cartilage, and lying almoſt in the ſame Direction with the Tuberoſity. The broad Sides end at their common Angle, by an obtuſe Point or Production, which has been called the Styloide Apophyſis of the Radius, and is really a Continuation of one of the bony Lines already mentioned.

666. The whole Baſis ends in an Oblong, Triangular, Glenoide Cavity, the Cartilage of which is continued over the hollow Edge of the narrow Side. This is an articular Cavity reſembling an Arch, and ending on one ſide at the Styloide Apophyſis, and hollowed on the other, by the Cavity of the narrow ſide. It appears divided into two Portions by a ſmall tranſverſe Line, and in the natural State the hollowed Side is lengthened out by a cartilaginous Production, the deſcription of which belongs to the Hiſtory of freſh Bones.

667. The middle or body of the Radius is a little incurvated, the Concavity lying between the Tuberoſity in the Head, and ſemilunar Cavity in the Baſis. It has three Sides, one rounded, which is the convex Side of the Curvature, and two concave: three Angles, two of which are obtuſe, diſtinguiſhing the two concave Sides from the convex; and the third ſharp, lying between the two concave Sides, oppoſite to the convex Side. In each of theſe Sides there are ſeveral muſcular Marks.

*Subſtance.* 668. The Subſtance of this Bone is like that of the Ulna. The Head and Baſis are Epiphyſes in Children, and in ſome Subjects remain ſuch for a long time afterward.

*Connexion.* 669. The Radius is connected with the Ulna, Os Humeri, and Carpus. It is articulated with the Ulna, at it's two Extremities, by a double lateral Ginglymus; the cartilaginous Circumference of the Head turning in the ſmall Sigmoide Cavity, and the ſemilunar Cavity in the Baſis turning upon the ſmall Head at the lower Extremity of the other Bone; and thus the ſmall Extremity of one Bone is joined to the great Extremity of the other.

670. It is articulated with the Os Humeri, by the application of the Cavity in the top of it's Head, to the ſmall Head at the lower Extremity of the other Bone. By this Conformation it would be capable of moving in all Directions, but as it is tyed to the Ulna at both Extremities, it's Motions on the ſmall Condyloide Head at the lower Extremity of the Os Humeri, are confined to two kinds; that of Rotation when it turns on the ſides of the Extremities of the Ulna, and that of Flexion and Extenſion, in common with the Ulna; and both theſe Motions may be performed at the ſame time.

671. The Articulation of the Radius with the Bones of the Carpus, ſhall be explained in deſcribing theſe Bones.

### §. 6. *The Bones of the Hand; and firſt, the Bones of the Carpus.*

*Situation in general, and Diviſion of the Hand.*

672. The Hand is the laſt part of the upper Extremity, and is divided into the Carpus, Metacarpus, and Fingers, as has been already ſaid in the Enumeration of the Bones of the Sceleton. It may be further divided into the concave and convex Side. The concave Side is likewiſe called the inſide, becauſe it is commonly, and as it were, naturally turned toward the Body, and ſo hid. The convex Side is, for the ſame reaſon, named the outſide, as being for the moſt part turned outward, and expoſed to view. The firſt is alſo named the Hollow or Palm of the Hand; the other, the back of the Hand.

*Situation in general, and Diviſion of the Carpus.*

673. The Carpus or Wriſt conſiſts of eight ſmall, unequal and irregular Bones; and taken all together they repreſent a ſort of Grotto of an irregular quadrangular Figure, and connected principally with the Baſis of the Radius. Conſidered in this manner, the whole Collection of them has two Sides, and four Edges. One of the Sides is convex and external, the other concave and internal. The Convexity of the outſide is pretty uniform, but the inner or concave Side has four Eminences, one at each Corner. One of the four Edges touches the Fore-Arm, and is, as it were, the Head of the Carpus; another Edge may be termed the Baſis, and touches the Metacarpus; the third is toward the Point of the Radius; and the fourth, toward the Point of the Ulna. The firſt of theſe laſt I ſhall call the ſmall Edge, the other the great Edge.

674. The Bones of the Carpus are divided into two Rows, the firſt of which lies next the Fore-Arm; the ſecond next the Metacarpus. Each Row conſiſts of four Bones, but the fourth of the firſt Row lies, in a manner, out of it's Rank. Each Bone has ſeveral cartilaginous Surfaces, for their mutual Articulations; and in ſome of them, for their Articulations with the Radius, and Bones of the Metacarpus, and Thumb.

675. It is to no purpoſe to diſtinguiſh the three ordinary Dimenſions in any of theſe Bones, except one; but in moſt of them we may conſider ſix Sides, one external, turned toward the convex Surface of the Carpus; one internal, toward the concave Surface; one towards the Fore-Arm, which I call the Brachial Side; one toward the Fingers, which I call the digital Side; one toward the Point of the Radius, or the radial Side; and one towards the Point of the Ulna, or the cubital Side.

676. Of theſe Sides ſome are Bony, others Cartilaginous or Articular. Theſe laſt I ſhall call Sides, the other Surfaces, as being Portions of the common Surface of the Carpus in it's natural Situation.

677. To diſtinguiſh theſe eight Bones from each other, they are called firſt, ſecond, third, and fourth Bones of the firſt or ſecond Row, beginning to count from the Radius or Thumb.

678. Lyserus has been at pains to give a particular Name to each of them. He calls the firſt Bone of the firſt Row Os Scaphoides or Naviculare; the ſecond, Os Lunare; the third, Os Cuneiforme; the fourth,

Os Piſiforme; the firſt Bone of the ſecond Row, Os Trapezium; the ſecond, Os Trapezoides; the third, Os Magnum; and the fourth, Os Unciforme.

679. The firſt Bone of the firſt Row is termed Scaphoides in *Greek*, *Os Scaphoides.* and Naviculare in *Latin*, from it's reſemblance to a ſmall Boat. Next the Radius it has a convex Side, by which it is articulated with the Baſis of that Bone, and a Tubercle, which is one of the four Eminences on the concave Side of the Carpus. Toward the Thumb it has two Half-Sides, one large one, for the Os Trapezium, and a ſmall one, for the Os Trapezoides. It has likewiſe a hollow Side for the Os Magnum, and a ſmall ſemilunar Side for the Os Lunare. The inner and outer Surfaces are rough.

680. The ſecond Bone of the firſt Row is called Lunare, becauſe one *Os Lunare.* of it's Sides is in form of a Creſcent. The articular Sides in this Bone are four in Number; one convex, for the Baſis of the Radius; one ſemilunar, for the Os Scaphoides; one almoſt triangular, for the Os Cuneiforme; and one hollow, which with the hollow Side of the Os Scaphoides, forms a cotyloide Cavity for the head of the Os Magnum. The convex Side, together with that of the Os Scaphoides, forms an oblong Convexity anſwering to the oblong Concavity in the Baſis of the Radius. The outer and inner Surfaces are ſmall and rough. This Bone would be better named Os Semilunare.

681. The third Bone of the firſt Row, called Cuneiforme from it's Figure, *Os Cuneiforme.* appears rather like a Wedge ſticking between the two Rows. It has a rough Surface with a ſmall Tubercle upon it, which forms the greateſt part of the cubital Edge of the Carpus; and four articular Sides, whereof one is convex, which completes the articular Convexity of the Carpus; one orbicular and internal, or on the concave Side of the Carpus, on which the Os Piſiforme is ſet; and two which make an Angle between them, one for the Os Semilunare, and the other for the Os Unciforme.

682. The fourth Bone of the firſt Row called Orbiculare, Piſiforme and *Os Orbiculare,* Lenticulare from it's Figure and Size, is irregularly round. It has but one cartilaginous Side irregularly orbicular, the Border or Circumference of which repreſents a ſort of narrow Collar. The reſt of the Bone is rough, convex, and irregularly round, making one of the four Eminences on the concave Side of the Carpus. This Bone and the Os Cuneiforme may be ſuppoſed to make a third Row diſtinct from the other two.

683. The four Bones of the ſecond Row lie all in a Line, the firſt being articulated with the Thumb, the reſt with the Metacarpus.

684. The firſt Bone of the ſecond Row is named Trapezium, as being *Os Trapezium.* ſuppoſed to be of an unequal ſquare figure. It's outer Surface is rough, and makes a Portion of the convex Side of the Carpus. On it's inner Surface is an oblong Eminence, which makes one of the four Eminences on the concave Side of the Carpus; and on the ſame ſide it has a Groove or Channel. There is likewiſe a ſmall Tubercle on the outer Surface.

685. It has ſeveral articular cartilaginous Sides, *viz.* one Brachial, one Digital, and two Cubital Sides.

686. The Brachial Side, which is hollow, is articulated with the Os Scaphoides; the Digital, with the firſt Phalanx of the Thumb; one of the

the cubital Sides, with the Os Trapezoides, and the other with the firſt Bone of the Metacarpus.

687. The Side which is articulated with the firſt Phalanx of the Thumb, appears to be made up of two ſuperficial Sigmoide or Semilunar Half-ſides, diſtinguiſhed by an Eminence of the ſame figure, being each more hollow toward the ſides than at the middle, which makes a Portion of a ſort of ſuperficial Pulley with the Edges much worn.

688. One of the cubital Sides, which is articulated with the Os Trapezoides, is large; the other, which joins the firſt metacarpal Bone, is ſmall.

*Os Trapezoides.* 689. The ſecond Bone of the ſecond Row deſerves the Name of Pyramidale, rather than Trapezoides, being a kind of Pyramid with the Point broke off. It's Baſis makes a Portion of the outer or convex Side of the Carpus, and it's Point a part of the concave Side.

690. It has ſeveral articular Sides, *viz.* one Brachial, which is the leaſt of all, and articulated with the Os Scaphoides; one Digital, of a conſiderable length, notched on each ſide and divided into two Halves by a ſort of middle Line or Angle, which gives it the appearance of a Pulley, articulated with the Baſis of the firſt Metacarpal Bone; one Radial, irregularly triangular, and articulated with the Os Trapezium; and one Cubital, a little hollow, and articulated with the Os Magnum.

*Os Magnum.* 691. The third Bone of the ſecond Row, called Os Magnum, is the largeſt of all the Bones of the Carpus. It is of a conſiderable length, and has a kind of articular round Head, which is received into the cotyloide Cavity formed by the two firſt Bones of the firſt Row: and this Articulation is capable of a ſmall degree of Flexion and Extenſion.

692. The Digital Side is a cartilaginous Baſis, unequally and obliquely triangular, the Apex being turned inward. It is articulated with the ſecond Metacarpal Bone, and is alſo a little notched on the Radial Edge for it's Articulation with the ſmall Edge of the firſt Metacarpal Bone.

693. The Radial Side is very ſmall and near the Baſis, being articulated with the Os Pyramidale; the reſt of this Surface is without Cartilage. The Cubital Side is double, anſwering to a like Side in the Os Unciforme, with which it is articulated.

694. The outer Surface, which forms a Portion of the convex Side of the Carpus, is broad, rough, and uneven, for the inſertion of Ligaments. The inner Surface is likewiſe rough, but narrower, and round both Surfaces are ſeveral Depreſſions, which in the natural State are filled with ſmall Glands, Ligaments, *&c.*

*Os Unciforme.* 695. In the fourth Bone of the ſecond Row we are to conſider the Body and hooked or unciform Apophyſis, from whence it has the name of Unciforme. This Apophyſis, one of the four Eminences on the concave Side of the Carpus, is flat, and the hollow Side of it's Curvature turned toward the Os Magnum.

696. The outer Surface of it's Body is rough, and, in ſome meaſure, triangular. It completes the convex Side of the Carpus, and toward the

Ulna terminates in a ſmall Tuberoſity, which is all the cubital Side of this Bone.

697. It has three articular or cartilaginous Sides, one Radial, one Brachial, and one Digital.

698. The Radial Side is double, anſwering to the Cubital Side of the Os Magnum. The Brachial Side is very oblique, ſome part of it being gently concave, the reſt gently convex, anſwering to the Digital Side of the Os Cuneiforme. The Digital Side is double, or diſtinguiſhed into two Halves, by a Sigmoide Angular Line, for it's Articulation with the two laſt Bones of the Metacarpus.

*Connexion and Subſtance.*

699. The Bones of the Carpus are articulated with each other by Arthrodia; but the firſt Row forms a ſort of Ginglymus with the ſecond, becauſe the Head of the Os Magnum may turn in the cotyloide Cavity of the firſt Row, while the two firſt Bones of the ſecond Row ſlide upon the Digital Side of the Os Scaphoides, and the Os Unciforme, in the ſame manner, on the Os Cuneiforme.

700. When all theſe Bones are in their natural Situation, a tranſverſe Depreſſion is formed on the convex Side of the Carpus, by which the two Rows are diſtinguiſhed. This depreſſion appears moſt between the Os Scaphoides and the three laſt Bones of the ſecond Row, and looks like a kind of fold by which the ſecond Row is thrown back upon the firſt. The four Eminences on the concave ſide of the Carpus are for the Inſertion of a ſtrong tranſverſe Ligament. The inner Subſtance of all theſe Bones is ſpungy, and their Surfaces are not very compact.

## §. 7. *The Bones of the Metacarpus.*

*Situation.*

701. The Metacarpus is the ſecond part of the Hand, ſituated between the Carpus and Fingers. The Ancients, who called the Carpus Brachiale, from whence the word Bracelet ſeems to be derived, termed the Metacarpus Poſt-brachiale.

*General Diviſion.*

702. The Metacarpus conſiſts of four Bones, one ſide of which forms a broad Cavity, called the Palm of the Hand; the other a gentle Convexity, called the Back of the Hand. The ancient Anatomiſts reckoned five Bones in the Metacarpus, including that Bone which is now looked upon as the firſt Phalanx of the Thumb.

*Figure and Size.*

703. The Bones of the Metacarpus are long, thicker at the Extremities than at the middle, and of unequal length and bigneſs. The firſt is the largeſt, the reſt are leſſened by degrees in all their Dimenſions. The two firſt are ſometimes, though very rarely, equal.

*Particular Diviſion.*

704. Each Bone is divided into the Extremities and middle Part, or into a Baſis, Body and Head. The Baſes are angular, and turned toward the Carpus; the Heads rounded like Condyles, and turned toward the Fingers. Both are covered with Cartilages, and the Heads remain for a long time very diſtinct Epiphyſes.

705. The Baſes are narrow and almoſt angular toward the Palm of the Hand; toward the Back of the Hand their Breadth is conſiderable, but on the other two Sides they are very broad; and there they have ſmall articular Sides, which I call lateral Sides. The Heads are flatted on the two Sides, which anſwer to the lateral Sides of the Baſis, and their greateſt Convexity is turned toward the Palm of the Hand, terminating in two obtuſe Points. Several Notches and Foſſulæ break in upon the lateral Sides, and the flat Sides of the Heads are a little depreſſed, a ſmall Tubercle ariſing in the middle of each Depreſſion.

706. The Body of each Bone is contracted, of a triangular Figure, and diſtinguiſhed into three Sides, whereof one is external and a little convex, contributing to make the Back of the Hand; the other two internal and a little concave, one being turned obliquely toward the Radius, the other toward the Ulna. Theſe three Sides are ſeparated by the ſame number of Angles, and that Angle which parts the two internal Sides is ſharp. It is by theſe two Sides and the Angle between them, that the Hollow of the Palm of the Hand is formed.

*Firſt Bone.* 707. The firſt Bone of the Metacarpus is longer, thicker and bigger, than any of the reſt, and ſupports the Fore-Finger. It's Baſis is a little hollow, anſwering to the digital Side of the Os Pyramidale of the Carpus. On the outer Edge there is a ſmall angular Notch, and on the cubital Edge of the Baſis a ſmall lateral Side, which is articulated with the Baſis of the ſecond Bone. The inner Edge is terminated laterally by an oblique Angle, which is articulated with the neighbouring Angle in the Baſis of the Os Magnum. Round the Baſis are Inequalities and Depreſſions for the Ligaments and articular Glands. The outſide of the Body of the Bone is broader toward the Head than toward the Baſis.

*Second Bone.* 708. The ſecond Bone of the Metacarpus ſupports the Middle-Finger, and has this peculiar to it, that it's Baſis is very oblique, terminating at the outer Edge by an angular Point turned toward the firſt Bone. By the triangular ſide of it's Baſis it is articulated with the Baſis of the Os Magnum, and by it's lateral Sides with thoſe of the firſt and third Bones of the Metacarpus.

*Third Bone.* 709. The third Bone of the Metacarpus ſupports the Ring-Finger, being leſs than the firſt and ſecond. It's Baſis is irregularly triangular, and proportionably leſs than the two former; and by the principal Side thereof it is articulated with the firſt half of the Side of the Os Unciforme. The ſmall lateral Sides of the Baſis join thoſe of the ſecond and fourth Bone of the Metacarpus.

*Fourth Bone.* 710. The fourth Bone of the Metacarpus ſupports the Little-Finger. The principal Side of it's Baſis, inſtead of being triangular, as in the other Bones, is all of an equal Breadth, a little oblique, and ſome part of it gently convex, the reſt gently concave, and articulated with the ſecond half of the Side of the Os Unciforme. By it's lateral Side it joins the correſponding Side of the Baſis of the third Bone, but in a much looſer manner than in the other Articulations of the like kind. In the oppoſite Side there is a ſmall Tuberoſity.

### §. 8. *The Bones of the Fingers.*

*Situation, Number, Figure and Size.*

711. The Fingers make the third part of the Hand, and terminate the whole upper Extremity. They are five in number in each Hand, called the Thumb, the Fore-Finger, the Middle-Finger, the Ring-Finger and the Little-Finger.

712. They may be ſaid in general to repreſent the ſame number of compound, long, ſmall bony Pyramids, convex on one ſide, gently concave on the other, and joined by their Baſes to the Carpus and Metacarpus, from whence they diminiſh gradually, and end in a ſort of ſmall Heads.

713. The Thumb is the biggeſt of all the Fingers; next to that is the third, called the long Finger. The ſecond and fourth are ſhorter than the third, the fourth being a very little longer than the ſecond. The fifth is the ſmalleſt of all.

*Diviſion.*

714. Each Finger conſiſts of three Pieces, called Phalanges; the firſt of which is longer and thicker than the ſecond, and the ſecond than the third. Each Phalanx is divided in the ſame manner as an intire Finger, into a Baſis, middle Portion, and Head; into two Sides, one convex, the other concave; and into two Edges. The Baſis of the Phalanges remain Epiphyſes for a long time, as well as the Heads of the metacarpal Bones.

*Firſt Phalanx of the Thumb.*

715. The firſt Phalanx of the Thumb is not like thoſe of the other Fingers. Ancient Authors reckoned it among the Bones of the Metacarpus, which it reſembles very much, and then they counted five metacarpal Bones, allowing only two Phalanges to the Thumb. The convex Side of this Phalanx is very much flattened, and broader toward the Head than toward the Baſis. On the concave Side is a kind of angular Line, which in ſome meaſure diſtinguiſhes it into two Parts. It's Head is like thoſe of the metacarpal Bones, only flattened at top.

716. The articular Side of it's Baſis is proportioned to the digital Side of the Os Trapezium of the Carpus, and framed in ſuch a manner as that the ſigmoide Cavities and Eminences in both Bones croſs each other. This Articulation has ſomething very particular in it. It is a kind of double Ginglymus, which readily allows of Flexion and Extenſion, Adduction and Abduction, but with difficulty permits the oblique Motions, becauſe then the two Sides run counter to each other.

717. The Head and Baſis carry for a long time the Marks of Epiphyſes; and for all theſe Reaſons, this Bone may be reckoned a metacarpal Bone degenerated.

*Second Phalanx.*

718. The ſecond Phalanx of the Thumb is ſhorter than the firſt; it's Body convex or ſemicylindrical on one ſide, flat on the other, and contracted between the Edges. The articular Side of the Baſis is gently concave, and ſurrounded near the Edges by ſmall Tuberoſities, as alſo near the Angle of the Phalanx. The Head is a regular Portion of a Pulley, which

projects more on the concave than on the convex ſide; and on each ſide of it there is a ſmall Foſſula, and ſome Inequalities in form of Tubercles. On the flat or concave ſide of the Phalanx are two rough Lines, one near each Edge, which are often deſtroyed in cleaning the Bones. They are the Impreſſions or Marks of the articular Vaginæ, which ſhall be explained in deſcribing the freſh Bones.

719. The Connexion of this Phalanx with the firſt, is by a kind of Arthrodia, or by a flat Enarthroſis, which permits a Motion in ſeveral Directions, though more limited than in other Articulations of the ſame kind. It is articulated with the third by a very perfect Ginglymus.

*Third Phalanx.* 720. The third Phalanx of the Thumb repreſents the half of a ſort of Cone, cut lengthwiſe, and by joining it to the ſame Bone of the other Thumb, an intire Cone is formed. The convex Side is more even than the flat Side, and on each Edge there is a Tuberoſity near the Baſis. The Baſis has two hollow Sides, which form a Ginglymus with the Head of the ſecond Phalanx. The Head is ſmall and flat, ending in a rough ſemicircular Border, which on the flat ſide of the Bone repreſents a Horſe-ſhoe.

*The other four Fingers.* 721. The other four Fingers in general, and their Phalanges in particular, are all nearly of the ſame Structure, differing chiefly in Size. The Fore and Ring-Fingers are almoſt equal, only the Fore-Finger is generally a little bigger, and ſometimes a little ſhorter than the other. The Middle-Finger is the longeſt, and the Little-Finger the leaſt. Almoſt the ſame proportions are to be obſerved in the Phalanges.

*Firſt Phalanges.* 722. The firſt Phalanges of theſe four Fingers are made nearly in the ſame manner with the ſecond of the Thumb, only they are longer in proportion, flatter on the concave Sides, and more rounded on the convex Sides. The Edges of the flat Sides have the ſame rough Line as the ſecond Phalanx of the Thumb. Their Baſes are more hollow, for their Articulation with the Heads of the metacarpal Bones, and their Heads are like Pulleys, as in the ſecond Bone of the Thumb.

*Second Phalanges.* 723. The ſecond Phalanges are ſhorter, narrower and thinner, than the firſt. Both Phalanges are gently incurvated, and reſemble each other in Structure, except that the ſecond contract by degrees from their Baſes to the Heads, which are very ſmall, and that their Baſes have a double Cavity for their Articulation by a Ginglymus, with the Heads of the firſt Phalanges. Their flat Sides have the ſame rough Lines already mentioned.

*Third Phalanges.* 724. The third Phalanges are in every thing like that of the Thumb, except that they are ſmaller, each of them being proportioned to the Fingers they belong to.

725. It is to be obſerved concerning all the Phalanges, that their Baſes have ſmall Tuberoſities, and their Heads, except thoſe of the laſt Phalanges, have on each ſide a roundiſh ſort of Foſſula, bordered with ſmall Eminences.

### §. 9. *The particular Situation and Uſes of the Bones of the upper Extremity.*

726. The Hand is generally repreſented in Sceletons and Figures as lying in the ſame Plane, and in the ſame longitudinal Direction with the Bones of the Fore-Arm. This gives a very falſe Idea of it's true Situation, which, with reſpect to the Fore-Arm, is oblique in two Reſpects. The Back of the Hand is inclined upon the convex Side of the Carpus, and makes an Angle with the Fore-Arm, and beſides, the fourth Bone of the Metacarpus is inclined towards the Ulna in particular. In a word, the Breadth of the Hand makes an Angle with the Breadth of the Fore-Arm, and the Thickneſs of the Hand at the ſame time with the Thickneſs of the Fore-Arm. I mean here that part of the Fore-Arm which is next the Hand.

727. This is owing to the Structure and Situation of the Bones of the Carpus, and to their Connexion with thoſe of the Fore-Arm. Firſt, the two Rows of theſe Bones make a ſort of tranſverſe Fold on the convex Side of the Carpus; and the articular Brachial Sides of the two firſt Bones of the firſt Row are turned a little toward the ſame convex Side of the Carpus; which obliges the whole Hand to be a little bent back in it's natural Situation. Secondly, the Edge of theſe Bones next the Ulna is much ſhorter than that next the Radius, which makes the cubital Edge of the whole Hand incline to that ſide.

728. By not conſidering this, a large void Space is commonly left in Sceletons, between the Extremity of the Ulna and the Os Cuneiforme of the Carpus. It ought likewiſe to be obſerved that the Edge of the Metacarpus next the Ulna is ſhorter than the other, ſo that in the Metacarpus a ſmall and great Edge may as juſtly be diſtinguiſhed, as in the Carpus.

729. In this oblique and natural Situation of the Hand, the Fingers being extended and a little ſeparated, the Extremity of the Fore-Finger will be found to anſwer to the Interſtice between the Bones of the Fore-Arm; and if in this Situation we make alternately the Motions of Pronation and Supination, the Extremity of the Fore-Finger will be found to be in ſome meaſure the common Center of theſe Motions.

730. This Diſpoſition of all the Bones of the Hand is moreover very well contrived, to give it ſeveral kinds of Attitudes; for by means thereof, it may be lengthened, flatted, ſhortened and contracted. The Hand is lengthened or widened, and flatted, by extending all the Fingers and turning back the Thumb, which is what is called Extending or Opening the Hand. It is ſhortened by bending all the Fingers, whether in what is called cloſing the Fiſt, or in graſping any thing; and to this the Situation of the Thumb, and the oblique Diſpoſition of the Bones of the Metacarpus and Fingers contribute in a particular manner. And as in this Caſe the Thumb counter-balances all the other Fingers, the Articulation of the firſt Phalanx thereof with the Os Trapezium appears to be rendered more firm and ſteady, by partaking a little of the Nature of a Ginglymus, without hindering it's other Motions. Laſtly, the Hand is contracted, and made into a ſort of Gutter or Furrow, by the Adduction of the Thumb, and the eaſy Motion

of the fourth metacarpus Bone already mentioned. And if at the ſame time we bend the Fingers and preſs them cloſe together, we both ſhorten and contract the Hand, and thereby form a hollow, which is called *Diogenes*'s Cup.

731. In the Fingers we ought likewiſe to remark, that though the Articulation of the ſecond Phalanx of the Thumb and firſt Phalanges of the other Fingers be moveable in many Directions, and framed nearly in the ſame manner as that of the Os Humeri with the Scapula, yet theſe Phalanges cannot be moved round their Axes. This is not owing to their Conformation, but to the want of proper Muſcles, as we ſhall ſee afterwards. The ſame thing cannot be ſaid of the firſt Phalanx of the Thumb, becauſe though it had proper Muſcles, yet the kind of half Ginglymus, by which it is articulated, would not allow of ſuch a Motion.

732. The Thumb is ſituated differently from the other Fingers. The Fingers, both with reſpect to their Sides and Edges, have in their natural Situation nearly the ſame Direction with the Plane of the Metacarpus. The Thumb being in it's natural Situation, and free from the Action of all it's Muſcles, it's convex Side anſwers to the convex Side of the Radius, and it's flat Side is turned toward the Little-Finger; and the firſt Phalanx makes an hollow Angle with the Radius, and a prominent Angle with the ſecond Phalanx; but both this and the third Phalanx lie in a ſtreight Direction, like that of the Fore-Arm.

733. The Carpus is the Baſis and Center of all the Motions of the Hand, except that of Rotation. By means thereof we can bend the Hand in all Directions, but with more eaſe toward the Sides and Edges, than any other way. The four Bones of the ſecond Row may have a ſmall degree of Motion on the firſt, ſuch as Ginglymus can allow of.

734. The Radius is in a manner the Handle of the Hand, and it is chiefly by means thereof, that we can move the Hand reciprocally as on an Axis, turning either Edge of it toward the Body. When the Radial or great Edge is turned to the Body, this Motion or Attitude is termed Pronation, and when the Cubital or ſmall Edge is toward the Body, it is termed Supination. In the natural and moſt ordinary Situation of the Hand, the Palm is turned toward the Body, and not the Edges.

735. This Diſpoſition of the Hand determines the true Situation of the Radius, which is not on one ſide of the Ulna in a parallel Direction, as the Figures and Sceletons commonly repreſent it; but the Radius croſſes the Ulna obliquely in ſuch a manner, as that the ſtyloide Apophyſes in both Bones are directly over-againſt each other. This is it's true natural Situation. The Radius being bent, may be ſtill further croſſed over the Ulna, than in it's natural Situation, and this happens in Pronation; but in Supination it is parallel to the other Bone.

736. The Ulna ſupports the Handle of the Hand, without being itſelf articulated with the Hand. Two lateral Ginglymi and very ſtrong Ligaments connect the Radius cloſely with it, ſo that in the moſt violent Motions theſe two Bones cannot be ſeparated. When we puſh or preſs any thing with the Hand, the whole force is ſuſtained by the Radius, the Baſis of

which ſupports the Wriſt, and it's concave Head is ſtrongly preſſed againſt the ſmall inferior Head of the Os Humeri. The oblique Direction of the Pulley of the Ulna is the reaſon that in bending the Fore-Arm upward, the Extremity of that Bone is naturally turned toward the Thorax, and not without difficulty toward the Articulation of the Scapula.

## ART. V.

### *The Bones of the lower Extremities.*

737. THE inferior Extremities are two in number, ſituated laterally below the Trunk, which both ſupports and is ſupported by them according to the different Situations of the Body. Each Extremity is divided into the Thigh, Leg and Foot. In deſcribing the Situation of all theſe Bones, I ſuppoſe the Subject to be ſtanding.

### §. 1. *The Os Femoris.*

738. The Thigh-Bone is the biggeſt and longeſt Bone of the Sceleton. It's Figure comes near that of a Cylinder, and it is a little bent at the middle. *Size and Figure.*

739. It lies in the ſame Direction with the Trunk; only a little obliquely, in ſuch a manner, as that the upper parts of the two Bones are a greater diſtance from each other than the lower. *Situation in general.*

740. It is divided into the upper, middle and lower Parts, or into the Body and two Extremities. *Diviſion.*

741. In the upper Extremity we are to conſider the Head, Neck and two Tuberoſities, one named the Great Trochanter, the other, the Little Trochanter. *Upper Extremity.*

742. The Head is rounded like a Portion of a Globe, or Ball, and covered with a very ſmooth Cartilage. It's Situation is obliquely outward, and a little forward, ſo as that the greateſt Portion of it's Convexity lies in the upper Part, and the ſmalleſt in the lower Part; and the Cartilage extends further on the Fore and Backſides, than on the other Sides.

743. A little below the middle of it's Convexity there is a Foſſula, nearly of a ſemilunar Figure, in which a Ligament is inſerted in the natural State. This Head is an Epiphyſis in Children, and in ſome Subjects remains ſuch for a long time, and is therefore liable to be ſeparated from the Neck by any violent Force.

744. The Neck is an Apophyſis, ſituated interiorly at the upper part of the Bone, being inclined upward, and a little forward, and making an Angle with the Body more or leſs oblique, but in ſome Subjects it lies almoſt tranſverſely. Towards the lower part it expands into a kind of Baſis; and at it's middle narrow Part, we obſerve a rough ſuperficial Impreſſion, which ſurrounds it like a Collar.

745. The great Trochanter is a large Tuberoſity lying on the exterior, and a little toward the poſterior part of the Baſis of the Neck. It is very high, and turned a little backward, terminating in an obtuſe Point in which

there is a Cavity or Foſſula. It's Convexity is unequal, and diſtinguiſhed into ſeveral Surfaces, which are muſcular Impreſſions; and the like Impreſſions are found on it's Edge and concave Side.

746. The little Trochanter lies on the poſterior and inferior part of the Baſis of the Neck, being turned inward.

747. Between the two Trochanters poſteriorly, there is an oblong, oblique Eminence, which is a ſort of Communication between them, and lengthens out the Cavity behind the great Trochanter. Anteriorly there is likewiſe a broad oblique Line, ſometimes conſiderably raiſed, which runs between the two Apophyſes, and terminates the Baſis of the Neck on the fore part.

*Lower Extremity.* 748. The lower Extremity of the Os Femoris is broad and thick, being, as it were, the Baſis of the whole Bone. We obſerve in it two large articular Eminences ſituated laterally with reſpect to each other, which are ſeparated, and very prominent on the backſide, but united like a Pulley on the foreſide. They are called Condyles, and with reſpect to the length of the Body of the Bone, the internal Condyle is longer, and reaches lower than the other; but regard being had to the Obliquity of the Bone, there is very little difference between them, both lying nearly in the ſame horizontal Plane.

749. The external Condyle is broader, and advances more forward than the other. They are covered with a ſmooth Cartilage, and though they both make but one Body, they are in ſome meaſure diſtinguiſhed on the fore and lower Sides by a ſuperficial Depreſſion, after the manner of a Pulley, and behind they are parted by a deep round Foſſa.

750. In this large Foſſa or Notch there are ſeveral ſmall Holes; and likewiſe two ſuperficial and pretty broad ſemilunar Impreſſions, one at the lower Edge of each Condyle; that on the internal Condyle being ſituated a little forward, and the other a little backward.

751. On the ſide of each Condyle there is a Tuberoſity, and behind that a muſcular Impreſſion, together with a ſmall cartilaginous Surface, on which lies a kind of ſeſamoide Bone, as we ſhall ſee in deſcribing the Muſcles.

*Body.* 752. The Body or middle Portion of this Bone repeſents a Pillar or Cylinder bent forward. We may however diſtinguiſh three Sides in it, one anterior, which is more rounded in the middle than in the upper and lower Parts; and two poſterior, more flat than the former, and ſeparated by a long angular Ridge, called Linea Aſpera, which is rough, unequal, and very prominent, and ſeems to ariſe from both Trochanters. On the outſide of this Ridge, toward it's upper part, there is a rough, longitudinal Mark, a little depreſſed toward it's lower Extremity. Below, the Linea Aſpera is divided into two, each running in the Direction of the Condyles; but being ſoon loſt after the Diviſion, a flat triangular Surface, very broad near the Condyles, comes in it's place. The external Line is more prominent than the internal, till they both vaniſh.

753. There is likewiſe another oblique unequal Line, before and under the little Trochanter, which, as it deſcends, unites with the Linea Aſpera. All theſe Lines, Ridges and Depreſſions are for the Inſertion of Muſcles. About the middle of the Bone on the back part we ſee ſometimes one Hole, ſometimes more, for the Paſſage of Blood-Veſſels and Nerves.

754. THE natural Direction of the Os Femoris is not perpendicular, but oblique, the ſuperior Extremity being inclined outward, the inferior Extremity inward; ſo that the two Bones, as has been already ſaid, are at a greater diſtance above than below; and from hence we ſee the reaſon why the internal Condyle appears to reach lower down than the external, when we view a ſingle Bone. *Situation in particular.*

755. THIS Bone is ſpungy at the Extremities, and hollow in the middle; the Cavity being filled with reticular Subſtances and Portions of Lamina detached from each Side. *Subſtance.*

756. IT is articulated above, by Enarthroſis with the Os Innominatum, it's Head being received into the Acetabulum; below, it is connected with the Tibia by a particular kind of Ginglymus, of which hereafter. *Connexion.*

### §. 2. *The Bones of the Leg; and firſt, the Tibia.*

757. THE Leg is the ſecond part of the lower Extremity, ſituated perpendicularly between the Thigh and the Foot, and conſiſting of two large Bones called Tibia and Fibula, and a ſmall one called Patella.

758. THE Tibia is a long Bone irregularly triangular and much larger at top than below. It's name is taken from the reſemblance it bears to a kind of Pipe or Flute uſed by the Ancients. It is divided into two Extremities and a middle Part, or into the Head, Body, and Baſis. *Figure and Diviſion of the Tibia.*

759. THE upper Extremity or Head of the Tibia conſiſts of two Condyles, the upper Side of which is flat and divided into two Cartilaginous Surfaces, almoſt Horizontal and a little hollow, one internal, the other external. Between theſe lies a Cartilaginous Tuberoſity, which appears to be double, and has Inequalities both on the fore and back Part, for the Inſertion of Ligaments. The two Surfaces anſwer to the two Condyles of the Os Femoris. The internal is ſomething oblong from before backward, and a little more depreſſed than the other. The external is rounder and deſcends a little backward. The whole Head taken tranſverſely is Oval, except toward the back part, where there is a ſuperficial Notch; and the Circumference is very rough. *Upper Extremity.*

760. THE external Condyle is more prominent than the internal, and on it's lower part, a little backward, there is a ſmall Cartilaginous Surface for the Articulation of the Fibula. On the fore part of the Head there is an unequal Tuberoſity, called the Spine of the Tibia, for the Inſertion of the Tendinous Ligament of the Patella.

761. ALL that part of the Head which lies above the level of the Spine, is Epiphyſis in Children; and the Spine is originally an Epiphyſis diſtinct from the other; but it afterwards becomes an Apophyſis of the Head of the Tibia.

762. THE lower Extremity is neither ſo thick nor ſo broad as the upper. It may be looked upon as the Baſis of the Bone, and on it's outſide there is a longitudinal Depreſſion broader at the lower, than at the upper part, which receives the end of the Fibula. On the inſide of the Baſis there is an *Lower Extremity.*

an Apophyſis called the inner Ankle; which runs down lower than any other part, and has towards it's poſterior Side a Groove or Channel, for the Paſſage of a particular Tendon.

763. The Baſis of the Tibia terminates in a tranſverſe oblong Cartilaginous articular Cavity, the capacity of which is increaſed on the inſide by the inner Ankle, the Cartilage being likewiſe continued over that Side of it, which is turned toward the cavity. Through the middle of this Cavity a ſuperficial Eminence runs, by which it is divided into a right and a left Portion.

764. All the inferior Portion of the Baſis of the Tibia, together with the Ankle, is Epiphyſis in Children, and the Marks thereof remain for a long time after the Oſſification is perfected.

765. The greateſt breadth or longeſt Diameter of the Baſis of the Tibia does not lie in the ſame Plane with that of the Head, the Ankle lying a little more inward than the internal Condyle. This Obſervation is of great conſequence in Fractures and Luxations.

*Body.* 766. The Body of the Tibia is in a manner triangular, being diſtinguiſhed into three Sides, one internal, one external, and one poſterior; and into three Angles, one anterior, called the Criſta of the Tibia, and two poſterior.

767. The inner Side is the broadeſt of the three, very equal, gently convex, and turned a little forward. The outer ſide is unequally flat and narrower than the former. The back ſide is unequally rounded, and the narroweſt of all. At it's upper part, however, it is of a conſiderable breadth, and there we obſerve a long oblique Muſcular Impreſſion, beginning under the Notch in the poſterior part of the Head, and from thence running downward toward the inner Side. Immediately below the Extremity of this Impreſſion there is another leſs oblique.

768. The anterior Angle, called Criſta, is ſharp, prominent about the middle, and almoſt round at the lower part. It might be reckoned a Continuation of the Tuberoſity or Spine. The internal poſterior Angle is ſomething rounded; the external is more acute, except toward the upper part, where it is more or leſs flatted.

*Subſtance and Connexion.* 769. The Subſtance of the Tibia is the ſame with that of the other long Bones. It is connected above, with the Condyles of the Os Femoris, by an Articulation which is partly a Ginglymus, for the Extenſion and Flexion of the Leg, and partly an Arthrodia for the Rotation of the Leg when bent. This is owing to two intermediate Cartilages which ſhall be examined in the Deſcription of the freſh Bones.

### §. 3. *The Patella.*

*Situation in general, Figure, and Size.* 770. The Patella is a ſmall Bone, ſituated above the Spine of the Tibia, reſembling a large Cheſnut. It is about half as thick as long, and it's length and breadth are nearly equal.

*Diviſion.*

771. It is divided into a Baſis, Apex, and two Sides, one convex, the other concave. The Baſis is the ſuperior, and thickeſt part of the Bone, and is marked with a very conſiderable Muſcular Impreſſion which runs down for a little way on the convex Side. The Apex is obtuſe, and ſerves for the Inſertion of a ſtrong Ligament, which ties the Patella to the Spine of the Tibia.

772. The anterior Side is convex, with ſome ſmall Inequalities and Furrows upon it. The poſterior Side is concave, covered with a Cartilage reaching near the Apex, and terminating at an unequal Cavity or Foſſula, which is an Impreſſion for the Ligament already mentioned. This Cartilaginous Side is parted in two by a Ridge which goes between the Baſis and Apex; and the two parts are exactly ſuited to the Pulley of the Os Femoris, the external part being broader than the internal, which is likewiſe obſervable in the Pulley.

*Subſtance.*

773. The Patella remains long, Cartilaginous, and in oſſifying, it becomes intirely cellulous, except the Surfaces of it's two Sides and the Impreſſions.

*Connexion.*

774. It is connected with the Tuberoſity of the Tibia by a thick ſtrong Ligament, and indeed I look upon it as belonging in a particular manner to the Tibia, or as a moveable Olecranum, which again may be looked upon as a fixed Patella. The reaſon of this difference in the two Extremities ſhall be given in the Hiſtory of the freſh Bones and Muſcles.

### §. 4. *The Fibula.*

*Size, Situation and Diviſion.*

775. The Fibula is a ſmall long Bone, irrregularly triangular, lying on the outſide of the Tibia almoſt oppoſite to the external poſterior Angle, but a little more backward. It is divided into the upper Extremity or Head, middle Portion or Body, and lower Extremity or Baſis.

776. The upper Extremity is a kind of Tuberoſity or Head obliquely flatted by a ſmall Cartilaginous Plane, by which it is articulated with the Cartilaginous Surface at the lower part of the external Condyle of the Tibia. It terminates backward by a kind of ſhort blunt Point directed upward.

777. The lower Extremity is broader, flatter, and more oblong than the upper. It is partly a continuation of the Body of the Bone, and partly an Epiphyſis in Children, the Marks of which are quite loſt in an advanced Age. It has, in a manner, three Sides, one rounded like a Tuberoſity, one flat, and the third narrow. When it is placed in the lateral Cavity of the Baſis of the Tibia it makes the outer Ankle, oppoſite to the inner Ankle. In it's natural Situation it reaches much lower down than the Baſis of the Tibia, and ends in a Point turned a little backward.

778. The flat Side is Cartilaginous, and turned toward the Cartilaginous Side of the inner Ankle, with which, and with the inferior Side of the Baſis of the Tibia, it completely forms the Cavity by which the Leg is articulated with the Foot. The narrow Side is turned backward, and near

it's lower part is a ſmall oblong, unequal Foſſula, formerly believed to be for the Paſſage of a Tendon, in which a ſmall Mucilaginous Gland is lodged. The Point by which the Baſis of the Fibula ends, has a ſmall ſmooth Surface immediately below the narrow Side, for the Inſertion of an annular Ligament.

779. The Body of this Bone is long and ſmall, more or leſs contorted and irregularly triangular. Near the two Extremities it contracts into a kind of Neck, and a little below the middle it is often bent inwards, but this Curvature ſeems chiefly owing to the method of dreſſing Children, for we ſometimes meet with this Bone very ſtrait. It is diſtinguiſhed in an irregular manner into three Sides, and three Angles, principally towards it's lower part.

780. The outſide is the moſt conſiderable. The upper half of it is more or leſs hollow; afterward it grows round, and altering it's Direction, becomes almoſt poſterior in the lower Half. The poſterior Side is more or leſs convex toward the upper part; then it grows flat, and turning in the ſame manner as the former, becomes nearly internal toward the lower part. The inner Side has likewiſe a turn below it's middle, and becomes anterior from thence downward; and this turn is marked by an oblique Line which runs down on this Side from behind forward, and divides it into two. Theſe Sides ſerve partly for Muſcles to lie upon, and partly for their Inſertions.

781. The internal Angle of the Fibula anſwers to the external poſterior Angle of the Tibia, and both ſerve for the Inſertion of the Interoſſeous Ligament of the Leg. The other two Angles are more or leſs ſharp, eſpecially the anterior, which is ſometimes like a kind of Criſta, and terminates below, in a ſmall triangular Surface.

*Subſtance and Connexion.*

782. The internal Structure of the Fibula, though a very ſmall Bone, is like that of the other long Bones. It is articulated by it's upper Extremity with the inferior Surface of the external Condyle of the Tibia. This Articulation is an Arthrodia with a very ſmall degree of Motion. The inferior Extremity is articulated by it's Cartilaginous Side, partly with the lateral Depreſſion in the Baſis of the Tibia, in the manner that ſhall be explained in the Hiſtory of the freſh Bones, and partly with the firſt Bone of the Foot, completing the Ginglymus between the Leg and that Bone.

## §. 5. *The Bones of the Foot*; *and firſt, the Bones of the Tarſus.*

783. The Foot is the third Portion of the lower Extremity, and is divided into three Parts, the Tarſus, Metatarſus, and Toes. The Vulgar mention ſeveral other parts of the Foot, ſuch as the Heel, the Point, the upper Part, the Sole, the Sides or Edges, one internal, the other external, *&c.*

784. The Tarſus conſiſts of ſeven Bones, much larger than thoſe of the Carpus; the names for which, in the order in which they are commonly deſcribed, are the Aſtragalus, Os Calcis, Os Scaphoides, Os Cuboides, and three Oſſa Cuneiformia. According to their Size they may be divided into three Claſſes of large, middle-ſized, and ſmall Bones. The Aſtragalus and

Os Calcis belong to the firſt Claſs; the Os Scaphoides and Os Cuboides to the ſecond; and the three Oſſa Cuneiformia to the third.

785. The particular Diviſions of each of theſe Bones, and indeed of all the Bones of the Foot, are much more eaſy than in the Bones of the Hand, becauſe the Foot remains always in the ſame attitude; and therefore the anterior, poſterior, ſuperior, inferior, lateral, and other Parts may be certainly fixed, without any danger of miſtaking.

*Aſtragalus.*

786. According to the natural Situation of the Foot, and it's Connexion with the Leg, the Aſtragalus is the ſuperior and firſt Bone of it. This Bone may be divided into two Portions, one large and poſterior, which is, as it were, the Body of the Bone; and one ſmall and anterior, which is an Apophyſis or the anterior Portion.

787. The Body or poſterior Portion has four Sides, one ſuperior, two lateral, and one inferior. The upper Side is the largeſt, covered all over with a Cartilage, cylindrically convex from before backward, with a Depreſſion running through the middle of it's breadth, which repreſents half a Pulley, and continuous with the two lateral cartilaginous Sides, of which the external is broader than the other. This upper Side is articulated with the lower Side of the Baſis of the Tibia, the internal lateral Side, with the inner Ankle, and the external lateral Side with the outer Ankle. Below the internal lateral Side there is a great Depreſſion without Cartilage, and ſeveral other Inequalities.

788. The lower Side is likewiſe cartilaginous and obliquely concave for it's Articulation with the Os Calcis. At the very loweſt and poſterior part of the Body of the Aſtragalus, on the Edge of the lower Side, is a ſmall, oblique, ſmooth Notch or Channel for the Paſſage of Tendons.

789. The Apophyſis or anterior Part of the Aſtragalus, is diſtinguiſhed from the Body by a ſmall Depreſſion on the upper Part, and on the lower, by a long, oblique, unequal Notch, very broad toward the outſide. The anterior Side of this Apophyſis is all cartilaginous and obliquely convex, for it's Articulation with the Os Scaphoides. The lower Side likewiſe cartilaginous is parted in two, and articulated with the Os Calcis, being diſtinguiſhed from the lower Side of the Body of the Bone by the long oblique Notch already mentioned. Beſides theſe two cartilaginous Sides there is a third below the anterior, towards the inner Part, which in the Sceleton touches nothing.

*Os Calcis.*

790. The Os Calcis is the largeſt Bone of the Foot, of which it makes the poſterior part, and, in ſome meaſure, the Baſis. It is oblong and very irregular, and may be divided into a Body and two Apophyſes, one great and anterior, the other ſmall, lateral and internal.

791. The Body of the Os Calcis has ſix Sides, one poſterior, one anterior, one ſuperior, one inferior, and two lateral.

792. The poſterior Side is broad, unequally convex, and as it were divided into two Portions, one ſuperior, ſmall, and poliſhed; the other inferior, much larger, unequal and rough, which in Children is an Epiphyſis; and may be named the Tuberoſity of the Os Calcis. The lower Part of it is bent

downward, and terminates in two Tubercles or obtuſe Points, which belong rather to the inferior than to the poſterior Side of the Bone.

793. The upper Side may be divided into two Parts, one poſterior and unequal, having a ſmall Depreſſion; the other anterior, convex and cartilaginous, proportioned to the great inferior Cavity of the Aſtragalus. This Side is turned obliquely forward, and by this Obliquity becomes part of the fore ſide, the remaining part of which is loſt in the anterior Apophyſis.

794. The lower ſide is narrow, and behind it lie the two Tubercles already mentioned, of which the internal is the biggeſt. They both ſerve for the Inſertion of the Aponeuroſis in the Sole of the Foot, but chiefly the biggeſt.

795. The two lateral Sides are continued over the anterior Apophyſis. The external is gently convex and unequal, covered only by the common Integuments and Ligaments. The internal is hollowed and depreſſed.

796. The great or anterior Apophyſis lies in the ſame Direction with the Body, being a continuation thereof. It has five Sides or remarkable Parts, and were it not for the Body, it would have a ſixth.

797. The upper Side has an irregular and unequal Depreſſion, which together with that in the Apophyſis of the Aſtragalus forms a conſiderable Foſſula. At it's anterior Extremity there is a ſmall cartilaginous Surface anſwering to one of thoſe in the Apophyſis of the Aſtragalus.

798. The anterior Side of the Apophyſis is broad, oblique, cartilaginous, partly convex and partly concave, and articulated with a like Surface of the Os Cuboides. This is the fore Side of the whole Os Calcis when conſidered without any Diviſion.

799. The outſide of the Apophyſis is very rough, being a Continuation of the outer Side of the Body, with a Tubercle or Eminence at the place where theſe two Sides meet, which, however, is not found in all Subjects. On the lower part of this Tubercle is a cartilaginous Surface for the Paſſage of the Tendon of the Peronæus Longus. Sometimes we ſee only ſome ſmall Veſtiges of this Eminence, and often none at all. We ſometimes meet with another ſmall cartilaginous Surface lower down and more forward, near the anterior Extremity of the Apophyſis, for the Paſſage of the ſame Tendon.

800. The lower Side is a Tuberoſity continued from the Side of the Body, and deſigned for the Inſertion of Muſcles.

801. The lateral Apophyſis is almoſt common to the Body, and to the great anterior Apophyſis, and increaſes the Cavity on the inſide of the Os Calcis. On it's upper Part it has a very ſmooth cartilaginous Surface, articulated with one of the inferior Surfaces of the Aſtragalus. This Apophyſis is very low down, and it's inferior Part is ſmooth for the Paſſage of Tendons.

*Os Scaphoides.*

802. The Os Scaphoides, called alſo Os Naviculare from it's reſemblance to a little flat Boat, lies before the Aſtragalus. It has two cartilaginous Sides, an Oval Circumference and a Tuberoſity. It's thickneſs is incon-

ſiderable when compared with it's other Dimenſions, and it lies, as it were on it's Side, before the Aſtragalus.

803. The concave Side is poſterior, articulated with the anterior convex Side of the Aſtragalus. The anterior convex Side is divided by two ſmall Lines into three Planes for the Articulation of the three Oſſa Cuneiformia.

804. The Circumference forms an Oval, which contracts by ſmall degrees, and terminates in an obtuſe Point. One Side of this Circumference is more convex and rough than the other, and the Inequalities in it ſerve for the Inſertion of Ligaments. The Point of the Oval ends in a Tuberoſity marked with a Muſcular Impreſſion. In the natural Situation of this Bone, the moſt convex Side is uppermoſt, the other, loweſt, and the Tuberoſity turned inward and downward.

805. By this Situation, and the difference of the Sides, it is eaſy to diſtinguiſh the Os Naviculare of the right Foot from that of the left. The ſmall or inferior Convexity of the Circumference has near the Tuberoſity a ſuperficial Notch, and on the oppoſite Side a ſmall cartilaginous Surface, and a ſmall Tubercle for it's Articulation with the Os Cuboides and the Inſertion of Ligaments.

806. The Os Cuboides is ſituated before the Os Calcis, on one Side of the Os Schapoides. It is a Maſs with ſix Sides all very unequal and very irregular; and from theſe it has it's Name. *Os Cuboides.*

807. The upper Side is flat and rough, for the Inſertion of the Ligaments which connect it with the neighbouring Bones.

808. The lower Side has an oblique Eminence, and immediately below that, a Canal or Groove which is likewiſe oblique. The Eminence divides this Side into two, and is a little cartilaginous on that Edge which touches the Groove. The Groove appears to be cartilaginous from a Ligament which lines it, and both that and the Edge of the Eminence ſerve for the Inſertion of an annular Ligament, and for the Paſſage of the Tendon of the Peronæus Longus.

809. The poſterior Side is cartilaginous, broad, oblique, partly convex and partly concave, anſwering to the anterior Side of the Os Calcis.

810. The anterior Side is pretty broad, and divided into two Portions by a narrow prominent Line, by which Portions this Bone is articulated with the third and fourth Bones of the Metatarſus.

811. The inner Side is the longeſt of all. It has a ſmall cartilaginous Surface, by which it is articulated with one of the Oſſa Cuneiformia. The reſt is rough, with ſeveral Depreſſions, in which Veſſels and Glands are lodged. Behind the cartilaginous Portion, there is in ſome Subjects another narrow Surface, which is articulated with the neighbouring Portion of the Circumference of the Os Scaphoides; this Articulation, when wanting, is ſupplied by Ligaments.

812. The outſide is the leaſt of all, irregular, ſhort, and narrow, and it has a Notch which communicates with the Groove on the lower Side.

*Oſſa Cuneiformia.*

813. The Oſſa Cuneiformia are three in number, ſituated before the Os Scaphoides, and they have their name from the reſemblance they bear to Wedges. The firſt is the largeſt, the third the leaſt, and the ſecond of a middle ſize between the other two. With the Os Cuboides they form a ſort of Arch, which on the ſide next the other Foot is high, and low on the oppoſite ſide.

814. In each Bone we may diſtinguiſh the Baſis, Apex, and four Sides, one poſterior, one anterior, and two lateral, whereof one is internal, the other external.

815. The firſt Bone is like a Wedge contorted and bent. It's Baſis is low down, unequally rounded, like an oblong Tuberoſity, ſerving for the Inſertion of a Tendon.

816. The internal lateral Side, or that which is turned toward the other Foot, is unequally convex and rough for the Inſertion of Ligaments.

817. The external lateral Side, or that next the ſecond Bone, is unequally concave, and cartilaginous toward the ſuperior and poſterior Edges. The largeſt Portion of this Side is articulated with the ſecond Bone; the reſt toward the anterior Edge is joined laterally to the ſecond Bone of the Metatarſus.

818. The back ſide is the leaſt, cartilaginous, and almoſt triangular, ſuited to the firſt of the three triangular Surfaces of the Os Scaphoides.

819. The anterior Side is cartilaginous, large, and ſemilunar, the convex Edge being turned to the other Foot, and by this, the firſt Os Cuneiforme is articulated with the firſt Bone of the Metatarſus.

820. The Angle is turned upward, and the Obliquity thereof occaſions the anterior Side to be the higheſt, and the poſterior the loweſt.

821. The ſecond Os Cuneiforme, the leaſt of the three, has the Baſis upward, and the Angle downward, and reſembles a Wedge more than the firſt. It's Baſis is ſhort and rough for the Inſertion of Ligaments. The back ſide is cartilaginous, and perfectly triangular, ſuited to it's Articulation with the middle Surface of the convex Side of the Os Scaphoides. The anterior Side is alſo cartilaginous, a little more oblong, and articulated with the Baſis of the ſecond Metatarſal Bone.

822. The two lateral Sides have, toward their ſuperior and poſterior Edges, oblong cartilaginous Surfaces, by which they are articulated with the firſt and third Oſſa Cuneiformia. The reſt of theſe two Sides is a little depreſſed, and thereby ſmall Interſtices or void Spaces are left between the Bones. This is every way the ſhorteſt Bone of the three. It's Angle is hid between the other two Bones of the ſame name, and does not reach ſo low as theirs, which makes this part of the Foot a little hollow.

823. The third Os Cuneiforme, of a middle ſize between the other two, has likewiſe it's Baſis upward and it's Angle downward. The Baſis is longer than that of the ſecond, almoſt flat or very little convex, and rough for the Inſertion of Ligaments. The Angle runs down lower than that of the ſecond Bone.

824. The back ſide is cartilaginous and triangular, that is, of the ſame figure with the third Surface of the convex Side of the Os Scaphoides. The anterior Side is likewiſe cartilaginous and triangular, but a little oblong, being articulated with the Baſis of the third Bone of the Metatarſus.

825. The internal lateral Side is broad, with two cartilaginous Surfaces, one toward the poſterior Edge, the other toward the anterior. The firſt is for it's lateral Articulation with the ſecond Os Cuneiforme, the ſecond for it's lateral Articulation with the Baſis of the ſecond Metatarſal Bone.

826. The external lateral Side is likewiſe broad, and toward it's poſterior Edge has a large cartilaginous Surface for it's Articulation with the Os Cuboides. Toward it's anterior Edge there is a ſort of void Space for the Paſſage of Veſſels, and ſometimes a little cartilaginous Corner for it's lateral Articulation with the fourth Bone of the Metatarſus.

### §. 6. *The Bones of the Metatarſus.*

827. The Metatarſus is the ſecond part of the Foot; and in ſome things it agrees with the Metacarpus, and differs from it in others. It conſiſts of five Bones, whereas the Metacarpus is reckoned to conſiſt only of four, and it forms a ſort of Grate, inclined in the ſame manner with the Arch of the Os Cuboides and Oſſa Cuneiformia. Theſe Bones are diſtinguiſhed only by the names of firſt, ſecond, *&c.* and to them we may add two Seſamoide Bones commonly preſerved in the Sceleton, which belong to the great Toe.

828. The Bones of the Metatarſus, like thoſe of the Metacarpus, may be divided into two Extremities, and a middle Part; or into the Head, Baſis, and Body. The Heads are ſituated forward, the Baſes backward, and both are cartilaginous as in the Hand. The Bodies are triangular, but diſpoſed in ſuch a manner, as that the Parts called external and internal in the Hand, are here the ſuperior and inferior.

829. The firſt of the five Metatarſal Bones is the biggeſt and ſhorteſt of all. The four following are proportionably longer than in the Hand, and their Baſes larger than the Heads; ſo that in their natural Situation, the Baſes take up a greater Space than the Heads. The Heads terminate, towards the Sole of the Foot, by two ſmall Productions as in the Hand. In theſe four Bones the inferior Angles of their Bodies are turned obliquely outward, and their Heads do not lie altogether in the ſame Direction with their Bodies. The Baſis of the firſt Bone, and the Heads of the other four, remain for a long time Epiphyſes; of which there are likewiſe ſome Marks in the Head of the firſt.

830. The Baſis of the firſt Bone of the Metatarſus has a ſemilunar Circumference, the flat Side being turned outward or toward the ſecond Bone of the ſame Foot, and the convex Side inward, or toward the other Foot. One point of the Creſcent is turned upward, the other downward; and the *Firſt Bone.*

whole Baſis is gently hollow, but broader toward the upper than toward the lower Part. At the external Edge or flat Side of the Baſis, there is often a cartilaginous Surface for it's lateral Articulation with the Baſis of the ſecond Bone; and at the lower part of the ſame Side, preciſely at the inferior Point of the Creſcent, there is a very remarkable and very conſtant Muſcular Impreſſion for the Inſertion of the Tendon of the Peronæus Longus. The Circumference of the Baſis is a little raiſed, like a flat Roll.

831. The Head of this Bone is thick, cartilaginous and convex on the fore and lower Part, but with this difference, that the Convexity on the fore part is ſimple and even, but on the lower, reſembles a double Pulley, having two Cavities and three Eminences, *viz.* two Edges, a Channel near each Edge, and an Eminence between the two Channels. The Convexity in general is for the Articulation of this Bone, with the firſt Phalanx of the great Toe, and the double Pulley for that of the two Seſamoide Bones already mentioned, and which ſhall be deſcribed after the Toes.

832. The Body of the Bone is triangular, and very big, having three Sides, two ſuperior and one inferior. One of the ſuperior Sides is internal and rounded, the other external and gently concave, and the inferior Side is flat. It has likewiſe three Angles, one ſuperior, and two inferior, one internal, the other external; on the lower part of which we ſee a ſort of Continuation of the tendinous Impreſſion of the Peronæus Longus.

*Second Bone.* 833. The ſecond Bone of the Metatarſus is the biggeſt of all. It's Baſis is large, triangular, and a little oblique, and the principal cartilaginous or articular Side thereof is obliquely triangular, anſwering to the anterior Side of the ſecond Os Cuneiforme. On each ſide, near the Baſis, there is a cartilaginous Surface for it's Articulations with the firſt and third Oſſa Cuneiformia, between which this Bone appears to be fixed.

834. Besides theſe lateral Surfaces, there are others on the anterior and upper part of the Baſis for it's lateral Articulations with the Baſis of the firſt and third Bones of the Metatarſus; ſo that this ſecond Bone is articulated with five others, *viz.* backward with the ſecond Os Cuneiforme, on one ſide, with the firſt Os Cuneiforme and firſt Bone of the Metatarſus, and on the other ſide with the third Os Cuneiforme, and third Bone of the Metatarſus.

835. It's Head is rounded, and reſembles pretty much that of the firſt Bone of the Metacarpus, having Tubercles, Points, *&c.* in the ſame manner.

836. The Body is long and obliquely triangular, the Angle that makes the hollow of the Foot, being turned obliquely outward. The reſt is proportionably as in the Metacarpus.

*Third and fourth Bones.* 837. The third Bone of the Metatarſus is ſmaller than the ſecond, and the Baſis of this and of the fourth Bone very narrow; and indeed theſe two Bones are very much alike. The third is conſiderably leſs than the ſecond, but the fourth is very little leſs than the third.

838. The Baſis of the third is deepeſt, conformably to it's Articulation with the anterior Side of the third Os Cuneiforme. Beſides this poſterior Side, it has lateral Surfaces for it's Articulation with the third and fifth Bones of the Metatarſus.

839. The Baſis of the fourth Bone is broader and ſhorter than that of the third, and articulated with one Portion of the anterior Side of the Os Cuboides. In every thing elſe it reſembles the reſt.

840. The fifth Bone of the Metatarſus has ſomething peculiar. It's Baſis is tranſverſely broader than it is thick or high, being very oblique, and terminating by a Tuberoſity and Point which lie a great way out of the Plane of the Baſis. The Tuberoſity is turned outward, and the Point quite backward. The principal Side is oblique, anſwerably to that of the ſecond Portion of the anterior Side of the Os Cuboides. *Fifth Bone.*

841. There is likewiſe an internal lateral Surface, articulated with the Baſis of the fourth Bone. The Tuberoſity and Point ſerve for the Inſertion of the Peronæus Medius. The poſterior part of the Bone is expanded proportionably to the Baſis, ſo that this Bone is obliquely Pyramidal; and the Tuberoſity reaches to the Ground, in the natural Situation of a Foot which has not been ſpoiled by high-heeled Shoes.

## §. 7. *The Bones of the Toes.*

842. The Toes make the third part of the Foot, and terminate the whole inferior Extremity, and with that, the whole Body. They are five in number in each Foot, called the Great Toe, the ſecond, third, fourth, and the Little Toe. The Figure of them is ſomething like that of the Fingers.

843. Each of the Toes, except the Great one, conſiſts of three Phalanges; the Great Toe has but two, whereas the Thumb has three; but then there are five metatarſal Bones in the Foot, and but four metacarpal Bones in the Hand. The Caſes of the Phalanges remain for as long a time Epiphyſes as thoſe of the Hand.

844. The Great Toe is very thick and big, whereas the other Toes are very ſmall in proportion to the Fingers. *The Great Toe.*

845. The firſt Phalanx of the Great Toe is pretty like the ſecond of the Thumb, but it's Baſis is more hollow, anſwerable to the Convexity of the firſt Bone of the Metatarſus, by which it is ſupported. It's Head is in form of a Pulley, as in the Thumb, but much broader.

846. The ſecond or laſt Phalanx of the Great Toe is like the third of the Thumb, but bigger and broader, eſpecially at the Baſis. The Tuberoſity in the ſhape of a Horſe-ſhoe, which terminates this Bone, is more unequal and more flat, than in the Thumb.

847. The other four Toes are very ſmall when compared with the Great one. The firſt Phalanges are the longeſt, but they are ſhorter and more convex than thoſe of the Fingers. Their Bodies are very narrow, and contracted *The other four Toes.*

tracted in the middle. The Baſes are generally excavated, and the Heads made after the ſame manner as in the Fingers.

848. The ſecond Phalanges are very ſhort, and almoſt without Shape. Both their Baſes and Heads are formed for Articulations by Ginglymi, but they are very imperfect. The Bodies are of ſome length in the ſecond and third Toes, but they are very ſhort in the other two, eſpecially in the Little Toe, the Body of which is broader than it is long.

849. The third Phalanges are nearly of the ſame figure with thoſe of the Fingers, but much ſhorter and thicker in proportion. In the two laſt Toes they are often united with the ſecond Phalanges, which is owing perhaps to the continual Inaction and Compreſſion occaſioned by the Shoes.

*Seſamoide Bones.*

850. The ſeſamoide Bones in general are very ſmall, being denominated from a Seed to which they are ſuppoſed to bear a reſemblance. Several ſuch Bones are found in the Joints both of the Toes and Fingers; but as they are for the moſt part very ſmall, and fixed chiefly to Ligaments, it will be more proper to ſpeak of them, in the Deſcription of the freſh Bones.

851. Two of them, however, are big enough to be preſerved in Sceletons. They reſemble a large flat oval Pearl, hollowed on one ſide.

852. They are about the third part of an Inch in length, and half as broad as long; and they are connected very near each other, by a ſmall ſhort Ligament, to the Baſis of the firſt Phalanx of the Great Toe, ſo as to ſlide on each ſide of the middle Eminence of the double Pulley in the firſt metatarſal Bone, like two ſmall Patellæ.

853. Though they are generally faſtened in Sceletons, to the firſt Bone of the Metatarſus, they nevertheleſs belong only to the firſt Phalanx of the Great Toe, as the Patella belongs not to the Os Femoris, but to the Tibia. I ſhall have occaſion to ſay ſomething more about them, in the Hiſtory of the freſh Bones.

## §. 8. *Mechaniſm and Uſe of all the Bones of the lower Extremity.*

854. The Articulation of the Os Femoris with the Os Innominatum, being by Enarthroſis, that is, the ſpherical Head of the Thigh Bone being lodged in the Acetabulum, the Thigh is diſpoſed to be moved in all Directions. We can carry it forward and backward, nearer the other Thigh or to a greater diſtance from it, and theſe four Motions may be rendered more or leſs oblique, and thus the number of them may be multiplied according to the different degrees of Obliquity.

855. All theſe Motions may likewiſe be combined in ſuch a manner, as that the lower Extremity of the Bone ſhall deſcribe a ſort of Circumference, while the Head moves only round a Center.

856. The Os Femoris may alſo have another kind of Motion, called by Anatomiſts, Rotation, though very improperly. By this Motion they underſtand two reciprocal Half-turns, that is, in oppoſite Directions to each other, which the Thigh is capable of making round an Axis, which they take for the Axis of the Bone; but it is very evident, if we conſider the Obliquity

of the Neck, that this Motion is not round the Axis of the Bone, but round a Line drawn from the Head to the middle of the Pulley at the lower Extremity, when the Subject is ſuppoſed to be ſtanding.

857. We are likewiſe to obſerve, that by this Rotation of the Os Femoris the Neck and great Trochanter are moved ſimply backward and forward; whereas when the Bone is moved directly forward or backward, the Neck moves more or leſs round it's Axis, eſpecially if at the ſame time the Bone be held at ſome diſtance from the other.

858. All theſe Motions of the Os Femoris are differently limited by the Structure of it's Articulation, and eſpecially by that of the Acetabulum; and likewiſe pretty much by the Situation of the Head on the ſuperior Extremity of the Bone. In a word, the Depth and Obliquity of this Articulation render the Mechaniſm thereof very particular, and it is of the greateſt Conſequence to be well acquainted with it in caſes of Luxations and Fractures. The following Obſervations will be ſufficient to give a true Idea of it.

859. The Thigh ought to ſupport firmly the Weight of the whole Body when we ſtand or kneel, and that in all the different Attitudes or Changes of Situation; that is, whether the Trunk be ſtrait, inclined or turned, and even with the addition of a conſiderable Load.

860. The Thigh is moveable in all Directions, but the Motion of Flexion is the greateſt of all, whether we ſtand or ſit; that of Adduction is likewiſe conſiderable, eſpecially when the Thigh is bent. Theſe two Motions are more frequent, as well as of a greater extent than the reſt; for it is chiefly by them that the Body is carried from one place to another, and alſo put in ſeveral ordinary and neceſſary Situations, whether in ſtanding, ſitting or lying.

861. These two general Diſpoſitions are founded on the Depth and Obliquity of the Articulation. By the firſt the Thigh becomes able to ſupport the Body in all the Attitudes already mentioned, and by the ſecond the principal Motions are made eaſy.

862. The Acetabulum or cotyloide Cavity is deeper on the upper and back part, than on the lower and fore part; and it is at theſe two Places, or in the middle Space between them, that the Body is ſuſtained, according as it is in an erect or inclined Poſture. The Structure of the Head of the Os Femoris is exactly ſuited to theſe ſupporting Points in the Acetabulum, it's cartilaginous Convexity being larger on the upper part than any where elſe.

863. The Acetabulum is ſhallow on the fore and lower Parts, not only becauſe theſe Parts are leſs neceſſary for ſupporting the Body, but alſo becauſe a Proviſion is thus made for the Obliquity of the Articulation, without which the Thigh could not without great difficulty have been bent, or carried inwards or over the other Thigh. The Obliquity of the cotyloide Cavity facilitates the Motion of Adduction, and the Obliquity of the Head of the Os Femoris facilitates and enlarges the Motion of Flexion.

864. In the Motion of Adduction, part of the Head of the Bone goes out of the Cavity, and that in two different ways. When we ſtand or lie

at full Length, and in theſe Poſtures ſeparate the Thighs from each other, the Head goes out at the lower part of the Cavity; but when we ſit or lie on our Backs with the Thighs raiſed, and ſeparate the Thighs, it goes out on the fore part.

865. The Motion, called Rotation, varies according as the Thigh is extended or bent. The Rotation of the Thigh when extended, brings the Head of the Os Femoris either forward or backward. When the Head is carried backward, the Neck ſtrikes againſt the poſterior Edge of the Acetabulum, and a large Portion of the Head goes out at the anterior part of the Cavity; but when the Head is carried forward, a very ſmall Portion of it goes out of the Cavity, becauſe of the Depth of the Edge at the back Part, and the Neck does not ſtrike againſt the anterior Edge which is very low. In the Rotation of the Thigh when bent, the Head is brought upwards and downward, and goes leſs out of the Cavity above than below.

866. The Articulation of the Tibia with the Os Femoris is of a very ſingular Nature. In the Flexion and Extenſion of the Tibia, it is a Ginglymus, but there is ſomething more in it ſtill, by which the Leg becomes capable of having a Rotation independent of that of the Thigh. This double Mechaniſm depends on the ſemilunar Cartilages, and therefore muſt be referred to the Deſcription of the freſh Bones. It will be ſufficient in this Place to make that Motion be conceived, which I term the Rotation of the Leg when bent; becauſe in that caſe only, it is poſſible, and we ſee it evidently when ſitting and preſſing the Heel againſt the Ground, we turn the Toes alternately outward and inward.

867. We then obſerve that the whole Leg makes reciprocal Half-turns independently of the Thigh; and if at the ſame time we put our Hand upon the Knee, and then graſp the Joint with our Fingers, we feel the Head of the Tibia to move in the ſame manner, while the Extremity of the Os Femoris remains at reſt.

868. And if we examine attentively, we ſhall find that the Center of this Motion is rather in the inner Cavity of the Head of the Tibia, than in the middle Space between the two Cavities, for we feel diſtinctly that the external part of the Head of the Tibia moves backward and forward, while the internal turns almoſt wholly round it's Axis.

869. We may therefore diſtinguiſh three ſorts of Motion in this Joint, that of Flexion and Extenſion, the Rotation of the internal part of the Head of the Tibia upon an Axis, and a kind of arthrodial Motion of the external part of the ſame Head.

870. I look upon the Patella as a Piece belonging as really and peculiarly to the Tibia, as the Olecranum does to the Ulna; becauſe it is of the ſame Uſes with reſpect to that Bone, as the Olecranum is of the other. They both ſerve to facilitate the Action of the Extenſor Muſcles, by placing their Direction at a greater diſtance from the Center of Motion of the Joint.

871. They both ſerve to defend the Tendons of theſe Muſcles from the Compreſſion, Contuſions and Ruptures which they would otherwiſe be

ſubject to in great Efforts, did they paſs over the ſharp Edges of the Bones; and laſtly, they ſecure theſe Tendons from the like Accidents when the Joints ſtrike againſt or preſs upon any hard Body, as when we lean on the Elbow or kneel; or when the Elbow or Knee receive any external Injury from Strokes, *&c.*

872. THE difference between the Patella and Olecranum lies in this, that one is immoveable, making but one Piece with the Ulna, the other is moveable, being a Piece diſtinct from the Tibia. The Immobility of the Olecranum ſtrengthens and ſecures the Articulation of the Ulna with the Os Humeri, which is deſigned only for Flexion and Extenſion.

873. FOR the ſame reaſon the Patella would have been immoveable, had the Articulation of the Tibia with the Os Femoris been contrived for theſe two Motions alone; and eſpecially becauſe the Extenſor Muſcles of the Tibia are very often expoſed to greater Efforts in ſupporting the Weight of almoſt the whole Body, ſometimes increaſed by that of a conſiderable Burden.

874. THE Rotation of the Leg when bent is the ſole Cauſe of this Difference, becauſe, had the Patella been immoveably joined to the Tibia, the Leg could never have made theſe Half-turns, without either a Luxation, or Fracture of the Patella. The Olecranum may therefore be looked upon as an immoveable Patella, and the Patella as a moveable Olecranum.

875. THE Fibula is articulated by it's upper Extremity, with the lower Surface of the external Condyle of the Head of the Tibia. This is an obſcure Arthrodia, and ſuffers the Head of the Fibula only to ſlide a little forward and backward; the only Deſign of which ſmall degree of Motion ſeems to be, that the Fibula in which many Muſcles of the Foot are inſerted, may have liberty to yield a little in the violent Efforts of theſe Muſcles, as in running much, jumping, or walking under a heavy Burden, as we ſhall ſee in the Expoſition of the Muſcles.

876. THIS Bone is likewiſe joined to the Tibia by it's lower Extremity, and makes the outer Ankle; but this Connexion is chiefly Ligamentary, as ſhall be ſhewn in the Deſcription of the feſh Bones. The upper Edge of the cartilaginous Surface of this Extremity is articulated at the lower part of the lateral Depreſſion of the Tibia, with a narrow cartilaginous Border, which is nothing but the thick Edge of the Cartilage at the Baſis of that Bone.

877. THE Extremities of theſe two Bones touch each other likewiſe a little by their bony Portions, near the Cartilages. The Articulation reſulting from theſe two ſorts of Connexion, has but a very ſmall Extent, and ſeems to be partly a Synarthroſis, partly a Diarthroſis; that is, a ſort of Amphiarthroſis or doubtful Articulation, almoſt without any Motion, except what is neceſſary to make it the Center of Motion of the upper Extremity of the Fibula.

878. THE cartilaginous Side of the external Ankle or lower Extremity of the Fibula completes the Cavity, by which the Leg is joined to the Foot, and contributes more to that than the internal Ankle.

879. The Crookedneſs frequently obſerved in the Fibula, below the middle, or at about two thirds of it's Length, does not ſeem to be natural, (becauſe we ſometimes meet with this Bone perfectly ſtrait) but to be rather owing to the manner of dreſſing Children, this being the Place at which they are ſwadled very tight.

880. The Fibula is not ſituated directly on the outſide of the Tibia, but a little more backward; ſo that having placed the two Legs of a Sceleton in their natural erect Poſture, a pretty thick Rod might be paſſed between the two Tibiæ and Fibulæ without changing the Situation of the Legs.

881. The Foot is articulated with the Leg by the Aſtragalus alone. This Articulation is a true angular Ginglymus, and confined intirely to the Motions of Flexion and Extenſion.

882. It is commonly thought that two other Motions are likewiſe performed by means of this Articulation, *viz.* that of turning the Toes inward or outward, and that of the lateral Flexion of the Foot, or the turning the Sole of the Foot toward either Ankle. But neither of theſe Motions depend on the Articulation of the Foot with the Leg, as the Structure of the Parts, and juſt Obſervations evidently ſhew.

883. The Articulation of the Aſtragalus with the ſeveral Surfaces of the Os Calcis is a kind of obſcure Arthrodia, as well as thoſe of the other Bones of the Tarſus with each other. By theſe Articulations, the Foot not being ſupported, makes the ſmall lateral Motions already mentioned; but when the Toes are turned outward or inward independently of the Tibia, the Os Calcis makes ſmall Half-Rotations under the Aſtragalus, and obliges the Os Scaphoides to ſlide in the ſame Direction with it on the anterior Side of the Aſtragalus; and this Motion of theſe two Bones is communicated to all the reſt.

884. It is by the Articulation of the Os Scaphoides with the Aſtragalus, that the ſmall lateral Flexions of the Foot are performed, *viz.* when the Sole of one Foot is turned toward the other Foot, or the contrary way. In this caſe the Os Scaphoides makes ſmall Rotations on the anterior Side of the Aſtragalus, while the Os Cuboides ſlides up and down on the foreſide of the great Apophyſis of the Os Calcis. The Obliquity of the articular Surfaces of theſe two Bones is perfectly ſuitable to ſuch a Motion. In theſe Motions the Os Calcis and Aſtragalus are in a manner immoveable; but the other Bones are carried along with the Os Scaphoides.

885. The Articulation of the Os Scaphoides and Cuboides with the three Oſſa Cuneiformia; that of the four laſt mentioned Bones, with thoſe of the Metatarſus; and that of the metatarſal Bones with each other, allow of an obſcure Motion, by which we can bend or contract the Foot according to it's length, and a little according to it's breadth likewiſe.

886. All theſe Motions of the Bones of the Tarſus and Metatarſus are pretty ſenſible in Children, and the loſs of them is often owing to the manner of wearing Shoes, which loſs is moſt frequent in the ſmall Bones of the Tarſus and thoſe of the Metatarſus. Womens high-heeled Shoes change intirely

tirely the natural State of theſe Bones, cauſing in them the ſame ſort of Diſorder that we obſerve in the Vertebræ of crooked Perſons. Thoſe who do not wear ſtrait Shoes may preſerve theſe Motions to a very advanced Age.

887. The Articulation of the firſt Phalanges of the Toes, with thoſe of the Metatarſus, is Spheroidal or Orbicular, and allows Motion in different Directions. The Articulation of the Phalanges with each other is by Ginglymus. In the natural State theſe Motions are very free and eaſy, and they are impaired chiefly by the bad manner of wearing Shoes, and it is for the ſame Reaſon that the Phalanges of the Little Toe often grow together.

888. The Articulation of the Seſamoide Bones is a kind of Ginglymus, but the Explication thereof belongs to the Hiſtory of the Muſcles.

SECT.

## SECT. II.

## *A Deſcription of the Freſh Bones.*

*Introduction.* 1. IT is not enough to have an exact Knowledge of the Sceleton, or of the common Oſteology; we ought likewiſe to be acquainted with the natural State of the Bones when freſh.

2. The famous *Riolan* uſed to demonſtrate theſe two kinds of Oſteology ſeparately, beginning his Courſes of Anatomy by the Sceleton, and concluding them by the natural bony Fabrick of the Body. This laſt he termed Oſteologia Nova, and he has given us an Idea of it in a particular Treatiſe placed at the end of his Enchiridion Anatomicum. His words are theſe. “ There are, he ſays, two kinds of Oſteology, one of which is to
“ be learned from Bones dried and prepared by boiling, *&c.* the other
“ from the Bones of a dead Subject, as they are naturally connected with
“ each other. Both theſe Methods are very neceſſary for the Practice of
“ Phyſick, and for the exact Knowledge of the Human Body.

3. “ For by examining dry Bones, we can only learn their exterior
“ Form, their Situation, and the Connexion which they may have with
“ one another. But when we conſider them as joined together in a dead
“ Body, we are in a condition to obſerve many other things about them,
“ uſeful in Phyſick, becauſe their Connexions with one another by Carti-
“ lages and Ligaments, and by the diverſity of Articulations, are ſome-
“ times very different in dry Bones from what we find them, when the
“ Bones are moiſt and freſh. There are, for inſtance, in dry Bones,
“ certain Cavities which appear to be Cotyloide, becauſe they are diveſted
“ of their Cartilages; but in freſh Bones they are found to be Glenoide,
“ their Cavities being filled by Cartilages. On the other hand, ſome Ca-
“ vities appear to be Glenoide in the Sceleton, which are Cotyloide in the
“ Body, their Cavities being augmented by cartilaginous Supercilia.

4. “ The exterior Form and Qualities of Bones are much better de-
“ monſtrated from freſh Subjects than from prepared Bones, becauſe they
“ loſe a great many things in boiling, ſuch as the cartilaginous Borders,
“ the Perioſtæum, the Mucilaginous Subſtance found between them, and
“ the Marrow contained in their Cavities; all which may be ſhewn in a
“ freſh Body, but cannot be ſhewn in a Sceleton.

5. “ It is therefore neceſſary, for the Practice of Phyſick, and eſpecially
“ for the Cure of fractured or luxated Bones, to examine attentively how
“ they are framed, and joined together in the Body. I would not, however,
“ be thought to diſprove the cuſtom of preſerving dry Bones, and of teaching
“ the common Oſteology. We ought always to begin by this, and after-
“ wards ſhew the natural Diſpoſition of the Bones, in the Body; in the
manner

" manner that I have done in my Courſes." Theſe are the expreſs Words of the illuſtrious *Riolan*, which I could not help tranſcribing.

6. This Method of making a particular, regular, and complete Demonſtration of all the Bones, newly cleaned from the Muſcles and other Parts that ſurround them, ſeems to have been wholly neglected ever ſince *Riolan*'s time, till I publickly reſtored it; but inſtead of ending my Courſes by the freſh Bones, I always demonſtrate them immediately after the Sceleton, becauſe I look upon this as one of the principal Foundations of Anatomy; and that it ought naturally to follow the common Oſteology, as being a neceſſary Introduction to the Knowledge of the Muſcles.

7. In this Oſteology I ſhall obſerve nearly the ſame order as in the former, beginning by what relates to the freſh Bones in general, and from thence going on to the particular Hiſtory of each Bone.

8. The general Doctrine of freſh Bones taken in their external Conformation, internal Structure, Connexion and Uſes.

9. In the particular Deſcription I ſhall follow the common Diviſion of the Sceleton; but I chooſe for reaſons which ſhall be given hereafter, to begin by the Extremities, and from thence to proceed to the Trunk and the Head.

10. I ſhall repeat as little as is poſſible, of what I have ſaid in the Deſcription of the Sceleton; but confine my ſelf to thoſe things only in which the Differences between dry and freſh Bones preciſely conſiſt.

## ART. I.

### *The external Conformation of freſh Bones.*

11. BY the external Conformation of freſh Bones, I underſtand, as in the common Oſteology, all that is viſible without breaking them, ſuch as their Size, Figure, outward Parts, and Colour.

12. The difference between freſh and dry Bones is chiefly owing to the parts that are peculiar to them, and to their natural Colour. I ſay, chiefly becauſe merely by drying, both their Size and Figure may be altered; but theſe Alterations are more remarkable in the Cartilages than in the Bones.

13. Of the external Parts of freſh Bones, ſome are common to them with dry Bones, ſuch as the Regions, Eminences, Cavities, and Inequalities; others are peculiar to them, as being either for the moſt part wanting in dry Bones; or, if they remain, their natural State being changed.

14. The external Parts peculiar to freſh Bones are principally the Cartilages, Ligaments, Membranes, and Mucilaginous Glands. On account of all theſe Parts, as well as of the Colour, the external Conformation of the Bones of a freſh Subject differ from that of a Sceleton, even in the other Parts which are common to both.

15. I SHALL here give a general Idea of each of theſe parts, referring what relates to the Colour to the Deſcription of the internal Structure.

### §. 1. *Cartilages of freſh Bones.*

16. A CARTILAGE is a whitiſh or pearl-coloured Subſtance, which covers the Extremities of Bones joined together by moveable Articulations, increaſes the Volume of ſome of them after the manner of Epiphyſes, unites others very cloſely together, and has no immediate Adheſion or Connexion with others.

17. THE Subſtance of Cartilages is more tender and leſs brittle than that of Bones, but with Age they ſometimes grow ſo hard as to become perfectly bony. They are pliable and elaſtic, and ſo capable of reſtoring themſelves after having been compreſſed or bent to a certain degree; but when bent beyond that degree, they break.

18. ALL that I have here ſaid about Cartilages is comprehended in the ſhort Definition which *Carolus Stephanus* has given of them in his Anatomy. "A Cartilage, he ſays, is a part of the Body, which truly deſerves the " name of ſimple or ſimilar. It is harder than all the other parts, but ſofter " than the Bones, white, ſmooth, poliſhed, and pliable or flexible. The Co-" heſion of it's parts is different in different Cartilages; and no ſenſible Ca-" vity, Cell or Pore, appears in any part of it's Subſtance, except very ſmall " Paſſages for the Blood-Veſſels, *&c.*"

19. I HERE ſpeak only of Cartilages that belong to the Bones. Thoſe which have no relation to them, are deſcribed in other parts of this Anatomical Expoſition. The Cartilages which belong to our preſent Subject, differ from each other in Size, Figure, Situation and Uſe; and may all be ranked under two general Heads; thoſe which are cloſely united to Bones, and thoſe which are not immediately connected with them.

20. THE Cartilages united to Bones are of four kinds, already hinted.

21. SOME cover both ſides of the moveable Articulations, and are very ſmooth and ſlippery.

22. SOME unite the Bones to each other, either ſo firmly as to allow no ſenſible Motion, as in the Symphyſis of the Oſſa Pubis, and ſtill more in that by which the Epiphyſes are joined to the Bones; or in ſuch a manner as to allow of different Motions, as in thoſe by which the Bodies of the Vertebræ are connected. The firſt grow eaſily hard, the others appear in ſome meaſure viſcid, and retain their flexibility.

23. SOME increaſe the ſize and extent of Bones. Of theſe again, ſome are articulated with other Bones, as the cartilaginous Portions of almoſt all the true Ribs, or with other Cartilages, as the Septum Narium; others ſerve only for Borders, as thoſe of the Baſis of the Scapula, and of the Criſta of the Os Ilium, the Supercilia of Cavities, and thoſe of the ſpinal and tranſverſe Proceſſes of the Vertebræ.

24. SOME, in fine, have a ſingular form, as thoſe of the Ears, and moſt of thoſe of the Noſe; in which laſt, their Elaſticity appears moſt ſenſibly.

25. The Cartilages belonging to the ſecond general Claſs, or thoſe not immediately joined to Bones, are, for the moſt part, placed in the moveable Joints; and may likewiſe be ſubdivided into ſeveral kinds.

26. Some lie altogether looſe, being joined neither to the articulated Bones nor to the Cartilages which cover them, but ſlide freely between them in different Directions; as thoſe which are placed in the Articulation of the Tibia with the Os Femoris; in that of the lower Jaw with the Oſſa Temporum; and in that of the Clavicle with the Sternum. Thoſe between the Clavicle and Acromium, and between the firſt and ſecond Vertebræ of the Neck are of the ſame kind.

27. Some are partly joined to other Cartilages, and partly ſlide between the Cartilaginous Extremities of the articulated Bones, as the Cartilage at the lower Extremity of the Radius.

28. We might likewiſe reckon among the Cartilages, though more improperly, ſeveral of the ſmall ſeſamoide Bones which remain long Cartilaginous, and alſo the Cartilaginous Portions of Tendons, which do the ſame Office with ſeſamoide Bones.

## §. 2. *The Ligaments of freſh Bones.*

29. A Ligament is a white, fibrous, cloſe, compact Subſtance, more flexible than a Cartilage, not eaſily ruptured or torn, and which does not yield, or at leaſt but very little, when pulled.

30. It is made up of very ſmall and very ſtrong Fibres, which by their different Texture and Diſpoſition, form narrow Cords, broad Bands, or thin Webs; and theſe ſerve to bind, contain, limit, and defend the other parts both hard and ſoft.

31. I am not here to ſpeak of the Ligaments peculiar to the ſoft parts, nor of thoſe which are common to the ſoft and hard parts; but confine my ſelf wholly to thoſe which belong to Bones or Cartilages alone. Of theſe we may eſtabliſh two general Claſſes; the firſt, containing thoſe Ligaments which are of uſe only to the Bones in which they are inſerted; the other, containing thoſe which ſerve for other parts beſides the Bones in which they are fixed, and principally for the Muſcles. If we have regard to the Bones only, theſe laſt are improperly termed Ligaments, as not doing the Office of ſuch, and conſequently reſembling the true Ligaments only in Texture.

32. Of thoſe Ligaments which are fixed in Bones or Cartilages alone, and are not imployed about the other parts, ſome belong wholly to the Articulations or moveable Bones, and others have nothing to do with the Articulations.

33. The Ligaments which belong particularly to the moveable Articulations, and may therefore be called articular Ligaments, are of ſeveral kinds.

34. Some are deſigned only to fix and ſtrengthen the Joints and to ſecure the Bones in their different Motions, from parting from each other, as it happens in Luxations. Theſe Ligaments are like Ropes more or leſs flat,

or like Bands, ſometimes narrow, and ſometimes of a conſiderable breadth; and though ſome of them are thin, they are all very ſtrong, and yield but little. The Ligaments of the Articulations by Ginglymus, and thoſe that tie the Bodies of the Vertebræ together, are of this kind.

35. Some contain a very fluid Mucilaginous Liquor commonly called Synovia, which continually moiſtens the Articulations. Theſe are not ſo properly Ligaments as Ligamentary Webs, bound immediately round the Articulations, and fixed to the Extremities of the articulated Bones, and thus forming Capſulæ or Bags to contain that Liquor, and hinder it from running out.

36. These may very well be named Capſular Ligaments. They lie within the former ſort, being cloſely united to their internal Surface, and are to be met with in all the moveable Joints, as in that of the Ulna with the Os Humeri, thoſe of the Bones of the Carpus with each other, *&c.* But they are more like Membranes than Ligaments properly ſo called.

37. Some perform both the former Offices, that of a Band to keep the Bones together, and of a Capſula to hold the Mucilage. Theſe ſurround the Orbicular Articulations, as that of the Os Humeri with the Scapula, of the Os Femoris with the Os Innominatum, *&c.*

38. All the parts of theſe Ligaments are not of equal thickneſs, ſo that they appear to be made up of two kinds of Ligaments inſeparably united or glewed together; one Capſular, which ſurrounds the whole Articulation, and ſeveral true Ligaments extended at different diſtances over the other, and cloſely united to it. The name of Orbicular Ligaments is not general enough, becauſe it does not agree to thoſe of the Bones of the Tarſus, Carpus, *&c.*

39. I do not think it proper to rank among theſe, the Membranous Vagina belonging to the Channel or Groove in the upper part of the Os Humeri, which ſhall be afterwards deſcribed.

40. Some are hid by the Joints themſelves and by the Capſular Ligaments, as that belonging to the head of the Os Femoris, called improperly Ligamentum Teres, and the Crucial Ligaments of the Tibia.

41. The Ligaments which ſerve to connect Cartilages with Bones, might be reckoned another Species of articular Ligaments; and of theſe ſome are proper, as thoſe belonging to the ſemilunar Cartilages of the Knee, to the Cartilaginous Trochlea of the Orbit, *&c.* Others are common, as all thoſe to which the inter-articular Cartilages are faſtened by their Circumferences.

42. The other Ligaments of the firſt Claſs, or thoſe fixed to Bones without any relation to the Articulations, are of two kinds.

43. Some of them are looſe, and ſerve only to ſet bounds to the Motions of Bones; ſuch as thoſe that tie the Clavicles to the Coracoide Apophyſes; thoſe that go from one Clavicle to the other, and thoſe between the Spinal Apophyſes of the Vertebræ.

44. Some of them are tight, and ſtretched either between the parts of the ſame Bone, as the Ligaments between the Acromium and Coracoide

Apophyſis, or between ſeveral Bones united together without Motion, as thoſe that are fixed by one Extremity to the Os Sacrum, and by the other to the Os Iſchium.

45. The Ligaments of the ſecond general Claſs, or thoſe which being fixed to Bones or Cartilages are likewiſe of uſe to other parts, are of two kinds. Some of them are fixed to Bones or Cartilages only, and ſome are likewiſe fixed to other parts, ot other parts are fixed to them.

46. Those of the firſt kind ſerve chiefly to incloſe, check, limit, and ſtrengthen the Muſcles and Tendons, and ſometimes to change their directions.

47. The annular Ligaments are of this kind, and they anciently had their Name not ſo much from their Figure, as from their Uſe, which is much the ſame with that of the Rings through which the Reins of Horſes paſs; for it is after the ſame manner that theſe Ligaments bridle the Tendons of many Muſcles, and thus hinder them from ſtarting from their places in violent Motions; and in ſome Circumſtances, change their Directions.

48. The annular Ligaments are either particular, and ſimple, or common, and made up of ſeveral ſingle ones, as we ſhall ſee in thoſe of the Carpus, Thumb, *&c.* Some of them are like Vaginæ or Sheaths, as thoſe on the internal or flat ſide of the firſt and ſecond Phalanges of the Fingers.

49. Some of them are only ſemi-annular, as that of the ſuperciliary Notch of the Orbit, when there is a Ligament there, and that of the Notch in the ſuperior Coſta of the Scapula.

50. To theſe might be referred the Ligaments between the Acromium and Coracoide Apophyſis of the Scapula, and between the Os Sacrum and Os Iſchium, which have been already mentioned in the firſt Claſs.

51. Those of the other kind, which come under this ſecond Claſs, comprehend the Ligaments fixed to other parts as well as to Bones, and theſe again are of two ſorts.

52. Some of them are fixed to one or more Bones with different degrees of Tenſion; and ſerve on each ſide for the inſertion of Muſcles, ſupplying, in that reſpect, the place of Bones.

53. Of this kind are the interoſſeous Ligaments of the Fore-Arm and Leg, the Obturator Ligament, the Ligament extended on each ſide of the Os Humeri, from the Neck to the Condyles, the poſterior and lateral Ligaments of the Neck, and the Ligamentary Membranes of the poſterior Foramina of the Os Sacrum.

54. To theſe may be added the Ligaments commonly termed Aponeuroſes; ſuch as thoſe of the Temples, Scapula, Os Humeri, Ulna, Palm of the Hand, Thigh, Leg, Sole of the Foot, *&c.* All theſe ſhall be deſcribed hereafter, and they may in general be termed Aponeurotic Ligaments, Ligamentary Aponeuroſes, Ligamentary Septa, Ligamentary Vaginæ, *&c.* Bnt they ought to be carefully diſtinguiſhed from the Aponeuroſes of the Muſcles and Tendons, which ſhall be mentioned in their proper

places. The Ligamentum Suſpenſorium of the Muſculus Styloglosſus belongs to this place.

55. Other differences of Ligaments may be deduced from their conſiſtence, ſolidity, thickneſs, ſituation, and figure, as we ſhall ſee hereafter.

56. Some Ligaments are almoſt Cartilaginous, as thoſe which ſurround the Head of the Radius, and the ſmall Head of the Ulna, a Portion of the Orbicular Ligament of the Head of the Os Femoris, and the annular Vaginæ of the Fingers.

57. Some of them have a particular Elaſticity; by which they are capable of being drawn out by a ſufficient Force, and of contracting again when left to themſelves. This Elaſticity differs from that of Cartilages, which laſt is hardly perceivable, but by compreſſing or bending them to a certain degree. It differs likewiſe from that of the other Ligaments, in that it is not only very conſiderable in living Bodies, but remains ſuch after death.

58. Of this kind are the Supercilium of the Cotyloide Cavity, the Ligaments which tie the Os Hyoides to the Styloide Apophyſes, the poſterior Cervical Ligament; the Ligaments which connect the ſharp Edges of the ſpinal Proceſſes of the Vertebræ to one another, and thoſe ſeated at the Baſes of theſe Apophyſes next the great Canal of the Vertebræ, eſpecially in thoſe of the Loins.

### §. 3. *The external Membranes of freſh Bones.*

59. The freſh Bones of the Human Body in their natural State, are for the moſt part covered exteriorly by a Membrane, called by the general name of Perioſteum, which is extended over the Cartilages and Ligaments, as well as over the Bones; but where it covers the Cartilages, it is termed Perichondrium, and where it covers the Ligaments, Perideſmium. Theſe terms are borrowed from the *Greek*, but I ſhall not ſpend time in clearing up their original Significations.

60. The Perioſteum in general is a fine, ſtrong Membrane, or Membranous Expanſion, not equally thick in all it's parts, more or leſs tranſparent, of a very cloſe Texture, not eaſily yielding, extremely ſenſible, and compoſed of ſeveral particular Planes of Fibres, differently diſpoſed and mixed with a great number of ſmall Veſſels and Nervous Filaments.

61. This Membrane does not immediately ſurround thoſe Portions of Bones which are covered by Cartilages, nor thoſe in which Ligaments and Tendons are inſerted. Neither does it cover thoſe Portions of Cartilages which are expoſed to friction, as in the moveable Articulations, Channels, *&c.* Laſtly, it does not cover thoſe Portions of the Teeth which lie out of the Sockets and Gums.

62. The innermoſt Plane of the fibrous Texture of the Perioſteum, or that which immediately adheres to the Surface of the Bones, is fixed thereto by an infinite number of ſmall fibrous Extremities brought from all the Planes, and which enter the Pores of the Bones. Theſe Extremities are

accompanied by capillary Veſſels and nervous Filaments, which, having run for ſome ſpace between the different Planes of the Perioſteum, perforate the innermoſt, at the Orifices of the Pores of the Bones.

63. The Perioſteum is of different thickneſſes; but this difference does not appear near ſo much on the outer Surface, as on the inner, which is marked in many places with Impreſſions owing to the Sulci, Depreſſions, Lines and Inequalities on the Surface of the Bones.

64. Some Anatomiſts have been of Opinion that this Membrane was not only united but cloſely braced round the Bones, and that therefore it might ſet bounds to their Growth. It is probable they had only examined a few Bones in this view; for had they conſidered thoſe which have concave Surfaces, Depreſſions and Inequalities, they would have found only a ſimple Adheſion of the Perioſteum without any Tenſion. In Places where it is only fixed to the Bones by the Filaments of it's innermoſt Plane, the Perioſteum is eaſily pulled from the Bones, but this Separation is more difficult where the Fibres of the other Planes likewiſe penetrate the Bone, eſpecially when theſe Planes are numerous; and likewiſe where the Inſertions of Tendons or Ligaments mingle with theſe Fibres.

65. The Perioſteum in general ſerves to ſupport that admirable Texture of an Infinity of capillary Veſſels, by which the Bones and all the Parts belonging to them are nouriſhed. It likewiſe ſupports a great number of nervous Filaments, by which Senſation is communicated not only to this and to the internal Membrane of the Bones, but even in ſome degree to ſome Portions of the Bones themſelves. Other Uſes of the Perioſteum ſhall be explained hereafter.

### §. 4. *The mucilaginous Glands of freſh Bones.*

66. In all the moveable Articulations, eſpecially of thoſe Perſons who end their Lives by ſudden or violent Deaths, we find a viſcid Liquor, in ſome meaſure reſembling a liquid Mucilage or the White of an Egg well beat, which is commonly called Synovia, a Name given at firſt to a Diſeaſe.

67. This Liquor is contained, together with the Articulations, in the Ligamentary Capſulæ which hinder it from running out. It is furniſhed chiefly by ſmall Bundles of Glands more or leſs flat, contained in the ſame Capſulæ, and known by the name of mucilaginous Glands; theſe being the Organs through which this Mucilage is conveyed from the Blood. It may likewiſe partly tranſude through the Pores of the internal Surface of the capſular Ligaments; and partly be made up of an unctuous Matter ſqueezed from the fatty Subſtances lying near the Glands, by the Motion and Friction of the articulated Bones.

68. Theſe Glands are more or leſs of a red Colour, and of a very ſingular Structure, reſembling ſmall floating Fringes, of different thickneſſes, made up of folliculous or veſicular Grains, and furniſhed with a great number of Veſſels running in very different Directions. In ſome places they appear

like diſtinct Grains immoveably fixed. They are proportioned to the Bones and Joints, and lodged ſo as to be ſecured from violent Frictions, chiefly near the Edges of the Capſulæ, or in particular Cavities contrived on purpoſe to receive them.

69. The Liquor continually furniſhed by theſe Glands, mixed with that which ſweats through the Pores of the Capſulæ, and perhaps with that which comes from the fatty Moleculæ, is diffuſed between the articulated Bones, and it's Uſe is to facilitate their Motions, to prevent them from bruiſing each other, and to keep their Cartilages from drying or wearing out.

70. In the particular Deſcription, we ſhall explain the differences of mucilaginous Glands, with reſpect to their Conformation, Size, Number and Situation.

## ART. II.

### *The internal Structure of freſh Bones.*

71. In order to become acquainted with the internal Structure of freſh Bones, their Subſtance, internal Cavities, Marrow, Membrana Medullaris, and Veſſels muſt be examined. The three laſt belong to this Treatiſe, the two firſt have been already deſcribed in the Treatiſe of dry Bones, which it would be very proper for beginners to reviſe, that they may comprehend as they ought what is here to be ſaid.

### §. 1. *The Marrow or Medullary Membrane of freſh Bones.*

72. The greateſt part of the Bones contain in their large Cavities or Cells an unctuous fat Subſtance of a ſolid Conſiſtence in ſome, and ſoft in others. It is called by the general Name of Marrow, eſpecially that which lies in the large Cavities of the long Bones. That which is diſperſed in the ſmall cellulous Cavities is likewiſe called the medullary Juice.

73. The Marrow of the great hollow Bones is a Maſs, compoſed of an Infinity of fine Veſicles or membranous Cells, joined together, and communicating with each other, furniſhed with Blood-Veſſels and Nerves, and filled with a fine ſweet oily Matter.

74. All theſe Cells or membranous Veſicles are ſurrounded by a very fine Membrane, which, like an internal Perioſteum, ſticks cloſe to the inner Surface of the Bone, by means of an infinite number of capillary Veſſels, and of ſeveral other kinds of very ſmall Filaments. The reticular Subſtance of the Bones runs through this medullary Maſs, and as it were interlards it, and by this means ſuſtains it in the middle of the great Cavities.

75. The Marrow of the cellulous or cavernous Subſtance of Bones is divided by ſmall bony Septa or Plates, and by the Filaments of the reticular Subſtance of Bones, into a vaſt number of Veſicles or membranous Cells which line the bony Cells, and communicate with each other. This cellular

Marrow in the cavernous Texture of Bones differs from that in the great Cavities, both in Colour and Conſiſtence. It is liquid, and almoſt quite of a red Colour, whereas the other is much more ſolid, and is often of a red Colour on it's Surface.

76. This difference is owing to the Blood-Veſſels which run through each membranous Cell, whereas the Marrow in the great Cavities ſeem to be furniſhed with them in the common Membrane only. Many of thoſe medullary Cells are likewiſe divided by the bony Filaments of the cavernous Subſtance, and theſe ſmall Filaments, as well as thoſe of the reticular Texture, are covered by Portions of the medullary Membrane, as by a Perioſteum.

77. The medullary Membranes may be ſeparated from the Liquor which they contain, by ſteeping the whole Maſs in very hot Water, and afterwards compreſſing it by gentle degrees. But it is to both theſe Subſtances taken together that Anatomiſts give the name of Marrow, not to either of them taken ſingly. The medullary Membrane is very ſenſible, but not the Juice, which is neceſſary to be obſerved to underſtand what is meant by the Senſibility of the Marrow. It is true, however, that in the Materia Medica, this Name is given to the oily Subſtance alone.

78. The Marrow by it's liquid and unctuous Part renders the Bones in ſome meaſure pliable, and leſs brittle, by continually running through the Subſtance of them in ſmall degrees. This continues to old Age, and then the Bones being deprived of the Marrow, become very brittle.

## §. 2. *The Veſſels of freſh Bones.*

79. All the parts of freſh Bones have Blood-Veſſels, which may be reduced to three Claſſes. Some go to the external parts of Bones, to the Ligaments, Cartilages, mucilaginous Glands and Perioſteum. Others penetrate the Subſtance of the Bone, and the third kind goes all the way to the internal Cavities, and is diſtributed to the Marrow.

80. The Veſſels of the firſt Claſs, that is, thoſe ſpread on the external parts of Cones, are Ramifications of thoſe which go to the neighbouring Muſcles, and other parts which lie near the Bones. The greateſt number of them go to the Perioſteum, and run in between it's different Planes, being divided into an infinite number of capillary Ramifications, diſpoſed in a reticular manner by their frequent Communications. I ſhall not here take upon me to determine whether this Membrane has any particular elaſtic Force by which it can increaſe that of the Blood-Veſſels.

81. The Veſſels of the ſecond Claſs, or thoſe of the Subſtance of Bones, are Productions or Continuations of thoſe of the Perioſteum, which enter the Pores of the Bones like very fine Filaments, and run longitudinally between the bony Fibres. The Exiſtence of theſe ſmall Veſſels becomes very certain from Fractures, eſpecially in young People.

82. The Arteries and Veins do not ſeem here to accompany each other as in the other parts of the Body, but to run in oppoſite Directions till they meet. This Conjecture is founded on the different Obliquity of certain

Holes. It muſt not however be imagined that all Arteries enter at one end of the long Bones, and that the Veins go out at the other; the reunion of fractured Bones is ſufficient to deſtroy this Opinion.

83. The Veſſels go to the inner Subſtance of the Bones, not only through the external Pores, but alſo through thoſe of all the inner Cavities, both great and ſmall, being detached from the medullary Membrane in the ſame manner, as from the Perioſteum.

84. The Veſſels of the third Claſs come likewiſe from the Perioſteum. They appear to be deſtined chiefly for the Marrow and medullary Juice, and are ſpread in great numbers over the Membranes of each. They enter the Cavities of the hollow Bones through the oblique Ducts in their ſolid Subſtance, and into the Cells by other ſmall Openings. They ſpread themſelves in all Directions, not only on the Membranes of the Marrow and medullary Juice, but likewiſe through the Subſtance of the Bones in their Paſſage to the inner Cavities.

85. The Arteries and Veins of this Claſs often accompany each other as they paſs through the Bones, and ſometimes each paſſes through a ſeparate Duct.

86. The Veſſels of the firſt Claſs ſerve chiefly to nouriſh the external parts of the Bones, and to furniſh the mucilaginous Glands with the Liquor ſecreted by them. Thoſe of the ſecond Claſs furniſh the nutritious Juice of the inner Subſtance of the Bones. The Uſes of thoſe of the third Claſs have been already mentioned.

### §. 3. *The Colour of freſh Bones.*

87. The natural Colour of the freſh Bones of an adult human Body is whitiſh, with a ſmall Mixture of a pale Red. This red Colour is more conſiderable in Children, but decreaſes by degrees as they grow up, and is quite loſt in old Age. It is moſt remarkable in the Surface of ſpungy Bones, and more toward the Extremities of the hollow Bones, than in the middle; and laſtly, it is more or leſs perceivable in proportion to the different thickneſs of the bony Laminæ which cover the cellular Subſtance.

88. This red Colour is owing to the Blood-Veſſels of the Bones, which being in Infancy, larger and leſs ſurrounded by the bony Juices, than in an advanced Age, make the Colour of the Blood to appear in ſome degrees through the Subſtance of the Bones; whereas in old Age theſe Veſſels being compreſſed by the increaſed and condenſed bony Juices, contain but very little Blood, and are not at all tranſparent. The particular differences of the red Colour, not only in the Bones of the ſame Subject, but alſo in the different parts of the ſame Bone, depends on the medullary Juice which is much redder than the Marrow in the great Cavities, and likewiſe partly on the thickneſs of the bony Subſtance by which that Juice is covered.

# ART. III.

## *The freſh Bones in particular.*

89. WHAT has been already ſaid about the mucilaginous Glands and Blood-Veſſels of freſh Bones in general, may be eaſily applied to the greateſt part of them in particular. But the Cartilages and Ligaments are different in each Bone, and therefore require to be particularly deſcribed. And as theſe Parts are more diverſified, largeſt and more diſtinct in the Extremities of the Body than in the Trunk; I think it proper to begin by theſe, that they may afterwards ſerve for Examples of what is to be ſaid about the reſt.

90. MOREOVER, as it is only in this Oſteology that a true Idea can be given of the Articulations in their natural State, I ſhall be obliged to begin by the Oſſa Innominata, becauſe of the Acetabulum with which the Os Femoris is connected, and becauſe of ſeveral other particulars neceſſary to be known in order to comprehend the Mechaniſm of that Articulation.

91. THO' the Oſſa Innominata belong to the Trunk in the ordinary Diviſion of the Sceleton, they may however be conſidered with reſpect to the lower Extremities, much in the ſame manner as the Scapula, with reſpect to the upper Extremities. For this Reaſon likewiſe I muſt ſay ſomething of the Os Sacrum to which theſe Bones are joined, and likewiſe of the laſt Vertebra of the Loins.

92. THIS particular Oſteology is attended with one Difficulty which does not fall in our way in the Deſcription of the Sceleton. We make a complete Deſcription of each dry Bone, which we cannot do of each freſh Bone, becauſe of the Connexion it has with the neighbouring Bones, ſome parts of which muſt conſequently be mentioned, eſpecially thoſe in which Ligaments are inſerted.

93. To remove this Difficulty, without breaking in upon that Order by obſerving which, theſe Deſcriptions will be eaſy and intelligible, I ſhall examine particularly the Ligaments of each Bone in the following manner: I ſhall firſt give the complete Hiſtory of the Ligaments by which each Bone is connected to thoſe immediately above it, and then barely mention thoſe that tie it to thoſe below.

94. I ſhall not explain in what Manner or for what Purpoſes the Bone which I have deſcribed, is joined to that which I am to deſcribe next in order, till the Deſcription of this laſt is likewiſe finiſhed. Thus, for inſtance, I ſhall not give the Hiſtory of the Connexion of the Os Innominatum with the Os Femoris, till I have explained all the parts of the Thigh-Bone concerned in that Articulation; nor the Hiſtory of the Connexion of the Os Femoris with the Tibia, till the latter has been deſcribed; and ſo of the reſt.

95. THIS Oſteology preſuppoſes the exact Knowledge of the foregoing, that is, of all the particulars relating to the Sceleton, of which I ſhall here

mention only as much as is neceſſary to enable us to apply to the Sceleton what has been already ſaid in general about freſh Bones.

### §. 1. *The freſh Bones of the lower Extremities.*

*Cartilages of the Oſſa Innominata.*

96. The Cartilages of the Oſſa Innominata are not ſo numerous, as one might imagine on examining the Sceleton only. We are apt to think we ſee the dried remains of Cartilages on the Criſta of the Os Ilium, on the Tuberoſity of the Os Iſchium, and on the Grooves and Notches which give paſſage to the Tendons of Muſcles. But none of theſe Incruſtations are true Cartilages, being for the moſt part Tendinous, Aponeurotic or Ligamentary, which being dried, look more like Cartilages than the true Cartilages themſelves.

97. The Cruſt which covers the Criſta of the Os Ilium is chiefly Tendinous, and a ſmall part of it Aponeurotic in adult Bodies, but in Children and very aged Perſons it appears Cartilaginous. In Children, the parts which are not completely oſſified, are eaſily taken for true Cartilages; and in old Age the Tendons are often hardened to ſo great a degree, as to have the very ſame Appearance. The Subſtance which covers the Tuberoſity of the Iſchium is almoſt intirely Tendinous, and that which lines the Grooves and Notches of the Tendons is chiefly Ligamentary.

98. The true Cartilages of the Oſſa Innominata in adult Subjects, are five in number, three common, and two proper.

99. The firſt and principal common Cartilage is that which makes the Symphyſis of the Oſſa Pubis. It reaches from the interval between the Spines of theſe two Bones, all the way to the Angle formed by the two Rami, where they begin to ſeparate. It is ſomething thicker or broader at it's upper part, than for a conſiderable Space lower down, but the inferior part is by much the broadeſt. It fills the Angle already mentioned, and forms a kind of Arch, which is more conſiderable in Women than in Men.

100. The two other common Cartilages join the Oſſa Ilium to the Os Sacrum, but are thinner than that of the Oſſa Pubis.

101. The proper Cartilages are thoſe that line the cotyloide Cavities. Concerning theſe, we have already obſerved in the Deſcription of the Sceleton, that in the Edge of each, there is a Notch or Opening between the anterior and inferior Parts; and that in the Cavity itſelf, there is a broad unequal ſhallow Depreſſion, reaching from the Notch, beyond the middle of the Cavity. All the reſt of the Surface of the Acetabulum is covered with a very white, ſhining, ſmooth Cartilage which terminates preciſely at the Edge of the Cavity.

102. The Circumference of the Acetabulum has beſides, a Border of a particular kind, the Subſtance of which is neither wholly Cartilaginous nor wholly Ligamentary; but I chooſe to place it among the Ligaments.

*Ligaments of the Oſſa Innominata.*

103. The Ligaments of the Oſſa Innominata are of two kinds, common and proper. The common Ligaments are thoſe which go between theſe and the neighbouring Bones, of which there is a conſiderable number, *viz.*

104. One ſuperior Ligament inſerted by one end in the internal Labium of the poſterior part of the Criſta of the Os Ilium, about an Inch above the Angle of that Criſta. It is about an Inch in breadth, and is faſtened by it's other Extremity in the whole inferior Edge of the tranſverſe Apophyſis of the laſt Vertebra of the Loins.

105. One inferior and anterior, fixed by one end in the inner Side of the Angle of the Criſta of the Os Ilium, and by the other in the ſuperior and anterior Part of the firſt falſe tranſverſe Apophyſis of the Os Sacrum. In this Ligament there are tranſverſe Openings which make it appear more or leſs complex.

106. Several inferior and poſterior, fixed by one end along the internal Labium of the Tuberoſity of the Criſta of the Os Ilium, and by the other in the firſt three falſe tranſverſe Apophyſes, and from thence extending laterally over the Marks of the falſe oblique Apophyſes of the Os Sacrum.

107. To theſe muſt be added the Ligaments by which the Os Femoris is joined to the Os Innominatum, which ſhall be deſcribed among the other Ligaments of the Thigh.

108. The principal proper Ligaments are four in Number, two called Sacro-Sciatic, one broad and external, the other ſmall and internal, one obturator and one inguinal.

109. The broad Sacro-Sciatic or internal Sciatic Ligament is ſlightly faſtened to the inſide of the Tuberoſity of the Criſta of the Os Ilium, covers exteriorly the two poſterior Spines of that Bone, and continues to be inſerted along the anterior and exterior Edges of the falſe tranſverſe Apophyſes of the Os Sacrum.

110. From thence this Ligament diminiſhing in breadth, deſcends obliquely towards the Tuberoſity of the Iſchium, and is inſerted immediately below the Sinus which lies between that Tuberoſity and the Sciatic Spine. This Inſertion is afterwards continued over the whole internal Labium of the inferior Portion of the Os Iſchium, and of the Ramus of that Bone, and the inferior Portion of the Ramus of the neighbouring Os Pubis.

111. Through all this latter Courſe of it's inſertion, that is, after it's arrival at the Tuberoſity of the Iſchium, it produces a kind of ligamentary Falx, one Edge which is fixed to the Bones, the other lies looſe; and by this Situation of the Falx, it forms, together with the Bones, a kind of deep Channel or Groove.

112. The ſmall Sacro-Sciatic or internal Sciatic Ligament adheres cloſely to the inſide of the poſterior Portion of the former. It is fixed interiorly to the Edge of the inferior part of the fourth falſe tranſverſe Apophyſis of the Os Sacrum, and from thence, all the way to the upper part of the Os Coccygis.

113. From this inſertion, it runs up a little obliquely to the Spine of the Iſchium, in the ſharp point and upper part of which it is fixed. During this Courſe, it croſſes the broad Ligament, being cloſely united to the inſide thereof, and loſes but very little of it's Breadth.

114. By theſe two Ligaments two diſtinct Openings are formed, a large one, with the ſuperior Sciatic Sinus, and a ſmall one, with the inferior Sciatic Notch.

115. The obturator Ligament fills up all the great Foramen Ovale, except the oblique Notch at it's upper part. It is faſtened preciſely to the Edge of the Circumference of that Hole, from the anterior part of the oblique Notch, all the way to the Symphyſis between the Os Pubis and Os Iſchium.

116. From thence to the poſterior part of the inferior Notch, it is fixed to the internal Labium of the Edge of the Circumference, forming a kind of ſmall Channel with the external Labium; and afterwards it is fixed to the common Edge of the Foramen Ovale and cotyloide Notch or Opening.

117. By this Diſpoſition, an Opening is left between this Ligament and the ſuperior oblique Notch; and immediately below this common Opening there are two ſmall Perforations in the Ligament alone.

118. On the inſide of the upper and anterior part of the Os Pubis, there is a tranſverſe Ligament, reſembling the ſhape of a Pent-houſe; fixed by it's upper part to the Os Pubis, from the oblique Notch of the Foramen Ovale, all the way to the lower part of the Symphyſis, at a ſmall diſtance from the Circumference of the laſt mentioned Hole.

119. This tranſverſe Ligament is about half an Inch in breadth in an adult Body; and poſteriorly below the ſuperior oblique Notch of the Foramen Ovale, it joins the obturator Ligament, by means of a particular Fold; and by parting from it afterwards, a kind of deep narrow Groove is formed between them, the tranſverſe Ligament being at this place ſupported by ligamentary Fræna of different Sizes.

120. The inguinal Ligament, called from the Diſcoverer, *Ligamentum Falloppii*, is an Aponeurotic or Ligamentary Band, faſtened by one end to the anterior and ſuperior Spine of the Os Ilium, and by the other, to the Spine of the Os Pubis. The middle Portion of it is very narrow, but it expands conſiderably toward both Extremities. It is cloſely joined to the Muſcles of the Abdomen and to the Aponeurotic Faſcia of the Thigh. It ſeems to be often wanting, as ſhall be obſerved in the Deſcription of theſe Muſcles.

121. Besides theſe Ligaments peculiar to each Os Innominatum, there is another ſmall flat and very ſtrong Ligament, which runs tranſverſely between the two Angles of the cotyloide Notch, and may be termed the proper or tranſverſe Ligament thereof.

122. The elaſtic Border of the cotyloide Cavity may likewiſe be reckoned among the Ligaments. It is a ſort of additional Piece ſtrongly united to the Edge of that Cavity, but eaſily yields both ways to any Preſſure. It may be ſtretched out by pulling, and recovers and contracts again when that Force is removed. It is of a very ſingular Texture, being compoſed of elaſtick Fibres, interwoven together through it's whole Circumference, and which, in ſeveral places, are by degrees inclined toward the bony Edge of the Cavity. It makes an intire Circle, and where it paſſes over the Notch,

the tranſverſe Ligament before mentioned ſerves to ſupport it, as the bony Edge of the Cavity does through all the reſt of it's Circumference.

123. Though I have referred the Deſcription of the two Ligaments by which the Os Femoris is connected to the Os Innominatum to another place, their Inſertions in the laſt named Bone muſt neverthelefs be mentioned here. One of theſe Ligaments ſurrounds the whole Articulation, the other is contained therein. The firſt is called the orbicular Ligament, the other very improperly, the round Ligament.

124. The orbicular Ligament is very ſtrong, and unequally thick. It ſurrounds the whole convex Circumference of the Supercilium of the cotyloide Cavity, to which it is ſtrongly fixed for the Breadth of near a quarter of an Inch, from the ſharp Edge outward, and from thence ſeems to ſend off a ligamentary Aponeuroſis, which ſhall be explained in the Hiſtory of the Muſcles.

125. It's Inſertion at the ſharp Edge of the cotyloide Cavity, joins that of the elaſtic Border; the reſt of the Ligament is diſtinct from the Border, and only touches it quite round; and where it paſſes over the Notch, it is fixed in the tranſverſe Ligament.

126. The Ligament which lies in the Joint is not round, as it's common Name would make us believe. It is a flat Cord, broad at one end, and narrow at the other, and therefore in ſome meaſure of a triangular ſhape. By it's narrow End, it is inſerted at the two Angles of the Notch of the cotyloide Cavity; and by the other, in the Os Femoris, in the manner hereafter to be deſcribed. This broad End may be reckoned the Baſis of the Ligament; and from thence ariſe ſome diſtinct ligamentary Filaments, which are inſerted at different Diſtances, in the Circumference of the rough Impreſſion of the cotyloide Cavity.

*Membranes, mucilaginous Glands and Marrow of the Os Innominatum.*

127. There is nothing in the Perioſteum of this Bone different from what has been ſaid above, except what relates to the Inſertion of ſeveral Muſcles; but that cannot be explained till theſe Muſcles are deſcribed.

128. The rough unequal Depreſſion at the bottom of the cotyloide Cavity, is filled by a broad flat mucilaginous Gland, bordered with a fatty Subſtance, and covered by a fine Membrane, through which a mucilaginous Liquor paſſes, to moiſten the Joint and facilitate it's Motions. This Membrane riſes above the Gland, and gives a ſort of Covering or Coat to the Ligament contained in the Joint. The Blood-Veſſels of this Gland paſs between the bottom of the cotyloide Notch, and the tranſverſe Ligament thereof.

129. As theſe Bones have no internal Cavity, and their Subſtance being cellulous or cavernous, they contain no medullary Maſs. The ſmall Cells of their cavernous Subſtance contain a medullary Juice, which diſtils inceſſantly through the Membrane with which they all are lined.

130. The Blood-Veſſels paſs chiefly through the ſmall Holes in both convex and concave Surfaces of theſe Bones, and ramifying upon the bony Cells, they end in a great number of ſmall capillary Tubes, which make the medullary Juice appear red.

*Cartilages of the Os Femoris.* 131. No part of the Os Femoris is covered with Cartilage, except the uniform Convexity of it's Head, and the articular Portion of the lower Extremity. The Trochanters have no true Cartilage, what looks like it, being only the remains of tendinous Inſertions, as has been already obſerved of the Criſta of the Os Ilium. The Cartilaginous Subſtance which, to a certain Age, unites the Epiphyſes to the body of the Bone, does not belong to this place, becauſe it is only found in the time of Youth, and in Adults is converted into Bone.

132. The Cartilaginous Matter by which the Head of the Os Femoris is cemented, deſerves, however, to be obſerved, becauſe that Epiphyſis has been ſeparated by violent Falls.

133. The Convexity of the Head of the Os Femoris all the way to it's Symphyſis with the Neck, is covered by a very ſmooth ſhining Cartilage. We have already remarked in deſcribing the dry Bones, that a little below the middle of this Convexity, and ſomething toward the back part, there is a Depreſſion in the ſhape of a Creſcent, the Cartilage being here interrupted by the Inſertion of the internal articular Ligament of the Head of the Os Femoris.

134. The Cartilage which covers the lower Extremity of this Bone, is exactly fitted to the ſemi-oval Convexity of the inferior Surface of each Condyle, and to the Pulley formed by their Union.

135. In the poſterior part of the lateral Tuberoſity of each Condyle, there is another kind of Cartilaginous Surface, which was ſpoken to in the Hiſtory of the Tibia.

*Ligaments of the Os Femoris.* 136. The Os Femoris is connected by it's upper Extremity to the Os Innominatum, and by the lower, to the Bones of the Leg, by means of ſeveral Ligaments. The Ligaments of the upper Extremity are two in number, one which ſurrounds the whole Articulation thereof with the Cotyloide Cavity, and one contained in the Articulation. The firſt is termed the orbicular Ligament of the Head of the Os Femoris; the other, the internal Ligament. To theſe we may, though very improperly, add a third, which is of the nature of a Capſular Ligament, as we ſhall ſee hereafter.

137. The orbicular Ligament is the moſt conſiderable, largeſt, and ſtrongeſt of all the articular Ligaments of the Human Body. It is fixed quite round the border of the Cotyloide Cavity in the manner already ſaid; and from thence largely ſurrounds the whole Head and ſuperior Portion of the Neck of the Os Femoris, and is cloſely inſerted in the lower Portion of the Neck, that is, between it's Baſis and middle narrow part.

138. This Ligament is made up of ſeveral ſorts of Fibres, the chief of which are longitudinal and oblique, and it is much thicker and ſtronger in ſome parts than in others. It is very thick between the anterior inferior Spine of the Os Ilium all the way to the ſmall anterior Tuberoſity, which unites, as it were, the Baſis of the great Trochanter with the Baſis of the Neck.

139. It is likewiſe very thick between the ſame Spine, and the middle part of the oblique rough Line obſervable between the Tuberoſity and the

little Trochanter; and here likewiſe it is ſtrengthened by a bundle of Fibres connected to the Paſſage of the Tendon of the Iliack Muſcle, and to the inferior Portion of the oblique rough Line. The Diſpoſition of the ligamentary Fibres of which theſe two thick Portions are compoſed, form a ſort of Triangle with the oblique rough Line which terminates the Baſis of the Neck.

140. At the poſterior and upper part of this Ligament, there is another thick Portion formed by oblique Fibres, one end of which is fixed between the inferior Edge of the Cotyloide Cavity, and the Paſſage of the Tendon of the external obturator Muſcle; the other, to the upper part of the ſmall Tuberoſity of the great Trochanter, already mentioned.

141. The poſterior and lower part of it is thinner and ſhorter than the reſt; but even this is ſtrengthened by a band of pretty ſtrong Fibres which from the whole Criſta of the Os Pubis, runs down obliquely near the fore ſide of the Cotyloide Notch, and is fixed in the upper part of the Baſis of the Neck of the Os Femoris, immediately above the ſmall anterior Tuberoſity of the great Trochanter.

142. The other Ligament of the Head of the Os Femoris which I call internal, reſembles a flat Cord, being compoſed of a bundle of Fibres cloſely interwoven. One end of it is in a manner divided into two flat Bands, inſerted one at each Corner of the Cotyloide Notch in the manner already explained. It might likewiſe be called the inter-articular Ligament of the Head of the Os Femoris.

143. From this Inſertion, it runs obliquely backward and a little upward between the Cotyloide Gland, and the Cartilaginous Convexity of the Head of the Os Femoris, and ends in the upper part of the ſmall ſemilunar Foſſula, which may be reckoned the Pole of that Convexity. This Inſertion is oblique, a little rounded on the upper part, and flat on the lower, and in ſome Subjects there is a ſort of Depreſſion in the Head of the Bone for the Paſſage of the Ligament.

144. The Ligaments of the lower Extremity of the Os Femoris, by which this Bone is connected with thoſe of the Leg, are ſix in number, one poſterior, two lateral, two middle or Crucial, and one Capſular.

145. The Crucial Ligaments lie within the Joint, and are fixed by one end to the back part of the Notch or Opening which parts the two Condyles. They are ſurrounded by the Capſular Ligament, but all the reſt lie on the outſide thereof, being cloſely joined to it.

146. Of the two lateral Ligaments, one is internal and broad, being fixed to the Tuberoſity of the internal Condyle; the other is external and narrow, fixed to the Tuberoſity of the external Condyle.

147. The poſterior Ligament is broad and thin, being fixed a little above the convexity of the external Condyle, from whence it deſcends obliquely, behind the great Notch and internal Condyle.

148. The Capſular Ligament glewed, as it were, to the three former, as has been ſaid, is fixed quite round the inferior Extremity of the Os Femoris, at a ſmall diſtance above the anterior, lateral, and poſterior

parts of the Cartilage, and above the poſterior part of the great Notch; and from the Cartilage and Notch, through the ſmall Space upward already mentioned, it covers the Bone; and afterwards is inverted downward to form the Capſula for the Mucilaginous Liquor of the Joint. The reſt of the Deſcription of all theſe Ligaments muſt be referred to that of the Bones of the Leg.

*Marrow of the Os Femoris.*

149. THE Marrow of the Os Femoris lies in a large Maſs in the middle Cavity of the Bone, and in ſmall diſtinct Cluſters in the Cells of each Extremity. The firſt is penetrated at different diſtances by the bony Filaments or Ramifications of the Reticular Texture, and thereby ſuſtained in violent Motions and Shocks, as in leaping, running, *&c.*

*Cartilages of the Bones of the Leg.*

150. THE Tibia has four or five proper Cartilages, and two additional ones.

151. THE two proper Cartilages which cover the two ſuperior Surfaces of the Head of the Tibia, are the thickeſt. They are both gently hollow, but the internal, or that next the other Tibia, is more depreſſed in the middle than the other. The back part of the external is inſenſibly depreſſed, and thereby a ſort of Convexity is formed. Anteriorly they join each other, poſteriorly they are parted by a ſhallow Notch; in the middle, they are ſeparated by the articular Tuberoſity of the Head of the Tibia, which is likewiſe partly covered by them on each ſide.

152. THE third proper Cartilage covers the ſmall Surface which lies on the lower part of the external Condyle.

153. THE fourth covers the lower Surface of the Baſis of the Tibia, being continued over the outſide of the inner Ankle. There are likewiſe ſuperficial Cartilaginous Incruſtations on the back part of this Baſis behind the inner Ankle, and likewiſe on the back ſide of the outer Ankle, all for the Paſſage of Tendons.

154. THE additional Cartilages of the Tibia are two in number, called ſemilunar from their Figure, and intermediate or inter-articular from their Situation.

155. EACH of theſe Cartilages is in the ſhape of a Creſcent, or Roman C. Their Convexity or greateſt Curvature is very thick, their Concavity or ſmalleſt Curvature very thin, ſomething like the Edge of a Sickle. They lie on the two upper Surfaces of the Head of the Tibia; their thickeſt part or Convexity anſwering to the Edges of the Head, and their thin ſharp Edges, to the middle of each Surface, their Extremities or Cornua being turned toward each other.

156. EACH Cartilage is broad enough to cover about two thirds of the Surface of the Tibia, on which it lies, leaving one third bare in the middle. Their under ſides are flat; the upper ſides hollow, and together with the middle Portions of the Surfaces of the Head of the Tibia, form Cavities proportionable to the Convexity of the Condyles of the Os Femoris.

157. THE Fibula has two Cartilages, one lying on the upper Extremity of that Bone, for it's Articulation with the ſmall Cartilaginous Surface in the

Head of the Tibia. The other Cartilage covers the inſide of the inferior Extremity, or of the outer Ankle, near the Point of which poſteriorly, there is a ſuperficial Cartilaginous Incruſtation for the Paſſage of the Tendons of the Muſculi Peronæi. The Cartilage at the upper Extremity of the Fibula ſeems to be thicker than that at the lower Extremity.

158. The Patella which belongs properly to the Tibia and not to the Os Femoris, has a pretty thick Cartilage on it's poſterior or articular Side, divided by a ſuperficial longitudinal Riſing into two parts proportioned to the two Portions of the Pulley of the Os Femoris, as has been obſerved in the Deſcription of the dry Bones.

*Ligaments of the Bones of the Leg.*

159. I have already obſerved, that the Tibia is connected with the Os Femoris by ſeveral Ligaments, two lateral, one poſterior, two middle, and one Capſular, and I have ſhewn in what manner they are fixed in the lower Extremity of the Os Femoris. Their Inſertions in the Bones of the Leg are as follow.

160. The innermoſt and broadeſt of the two lateral Ligaments is fixed pretty low down, on the inner ſide of the ſuperior part of the Tibia between the beginning of the Criſta or anterior Angle of that Bone, and the internal Angle which is turned toward the other Tibia. It is likewiſe joined to the Edge of the internal ſemilunar or inter-articular Cartilage.

161. The external lateral Ligament, which is narrower and thicker than the former, is fixed partly in the Tibia immediately above the Fibula, and partly in the upper Extremity of the Fibula; and is joined likewiſe to the Edge of the external ſemilunar Cartilage. Both theſe Ligaments lie a little behind the middle of the Articulation.

162. The poſterior Ligament is fixed by ſeveral Expanſions, in the poſterior part of the Head of the Tibia.

163. One of the crucial Ligaments is fixed by one end to the internal ſuperficial Impreſſion in the Notch of the Os Femoris, and by the other, to the Notch in the Head of the Tibia, behind the Cartilaginous Tubercle which lies between the two ſuperior Surfaces. The other Crucial Ligament is fixed by one end to the external Impreſſion in the Notch of the Os Femoris, and by the other, between the anterior Portions of the Surfaces juſt mentioned, before the Cartilaginous Tubercle.

164. These two Ligaments are compoſed of ſeveral Series of Fibres. The firſt, which is internal in reſpect of the Os Femoris, and poſterior in reſpect of the Tibia, is broader and ſtronger than the other, which is external in reſpect of the Os Femoris, and anterior in reſpect of the Tibia.

165. The ſemilunar Cartilages have likewiſe particular Ligaments, beſides their Connexions with the lateral Ligaments of the Tibia. Their Cornua do in ſome meaſure degenerate into ſhort ſtrong Ligaments, by which they are faſtened to the Cartilaginous Tubercle between the two ſuperior Surfaces of the Tibia, and likewiſe communicate by ſome Portions, with the Crucial Ligaments.

166. They have likewiſe a common Ligament, which like an Arch runs tranſverſely between the anterior Convexity of the one, to that of the other.

167. These Cartilages therefore have three ſorts of Connexions. They are faſtened to the Tibia by the Ligaments of the Cornua, to each other, by the tranſverſe Ligament; and to the Os Femoris, by their Communications with the crucial Ligaments, and by their Adheſions to the lateral and capſular Ligaments.

168. The Patella is faſtened to the Tuberoſity or Spine of the Tibia by a broad and very ſtrong Ligament which runs down directly from the Apex of the Patella, and is oftentimes further ſtrengthened by ſome Fibres of a conſiderable Tendon inſerted in the upper part of that Bone.

169. It has likewiſe ſmall lateral Ligaments, fixed in the lower part of it's Edge on each ſide, which parting gradually from the great Ligament as they run down, are inſerted anteriorly and a little laterally in the Edge of the Head of the Tibia.

170. The capſular Ligament of this Joint, of which I deſcribed one part in ſpeaking of the lower Extremity of the Os Femoris, is fixed round the Edge of the Head of the Tibia, and in the Edge of the Patella, ſo that the Patella itſelf forms a Portion of the mucilaginous Capſula of the Joint of the Knee.

171. The crucial Ligaments, and thoſe of the ſemilunar Cartilages are included within this Capſula; but the lateral and poſterior Ligaments and thoſe of the Patella lie without it, being cloſely joined to it's outer Surface.

172. This Capſula is likewiſe joined to a conſiderable Portion of the Circumference of the ſemilunar Cartilages, and it is alſo ſtrengthened at different diſtances, by ſeveral diſtinct Series of ligamentary Fibres, more or leſs thick. The inſide of it is ſmooth and ſhining, and it is very thin where it is not covered by Tendons, as ſhall be obſerved hereafter. It not only contains and ſurrounds the Ligaments already named, but likewiſe furniſhes them with a very fine Vagina.

173. There is likewiſe a very thin Ligament fixed by one end to the lower part of the Cartilaginous Side of the Patella, and by the other, to the anterior part of the great Notch between the Condyles of the Os Femoris, the uſe of which ſeems to be to hinder the articular Fat from being compreſſed in the Motions of the Knee.

174. The Fibula is joined to the Tibia by nine Ligaments, four at each end, and one in the middle called the interoſſeous Ligament.

175. The Ligaments at the upper Extremity of the Fibula are ſhort, very ſtrong, more or leſs oblique and compound. Two of them are anterior, two poſterior, and they lie on each other; the ſuperior Ligaments ſurrounding the Articulation more cloſely than the inferior, which leave a ſmall void Space, and are weaker than the former. They are all glued to the capſular Ligament which runs in between them and the Articulation, and they are inſerted round the Edges of the cartilaginous Surfaces in each Bone.

176. The Ligaments of the lower Extremity of the Fibula, which runs below the Tibia, and forms the outer Ankle, are much ſtronger, thicker, more complex, broader, longer, and more oblique than thoſe of the ſuperior Extremity; and are diſpoſed much after the ſame manner, that is, two before, and two behind.

177. They are fixed to the anterior and poſterior Edge of the lateral Depreſſion at the inferior Extremity of the Tibia, and from thence they run down on the lower end of the Fibula. The two inferior Ligaments are longeſt, and they are fixed anteriorly and poſteriorly at the lower end of the outer Ankle. The two ſuperior are fixed more cloſely and nearer each other, but ſtill there is a ſmall Space between them filled with Fat.

178. As the two Bones touch each other only by the upper part of the Cartilaginous Surface of the outer Ankle, and the ſmall Cartilaginous Border in the lower Edge of the Depreſſion of the Tibia; the middle Space between them is filled by a ſort of capſular Ligament, which lines each ſide of the Bones, and is continued down to the true Articulation of the external Ankle, with the inferior Edge of the Baſis of the Tibia.

179. The middle or interoſſeous Ligament of the two Bones of the Leg, ſo called becauſe it fills up all the Space left between them, being ſtretched from one to the other, is fixed along the poſterior external Angle of the Tibia and the neighbouring Angle of the Fibula.

180. It is made up chiefly of two Planes of very oblique ligamentary Fibres, which croſs each other, and, at different Intervals, ſeem to be multiplied. It is perforated both above and below, and ſometimes in ſeveral places beſides, for the Paſſage of the Blood-Veſſels and Nerves.

181. It is not a Ligament deſigned to tie theſe Bones together, but rather a ligamentary Septum for the Inſertion of Muſcles, in which reſpect it ſupplies the place of Bones; and ſeems partly to be a continuation of the Perioſteum of the Tibia and Fibula.

182. At the lower part of each Ankle there are commonly three ſtrong Ligaments for the Connexion of the Bones of the Tarſus with thoſe of the Leg, one that runs forward, one that runs backward, and one that runs more or leſs directly downward; all of them being fixed in the places hereafter to be mentioned.

183. There are ſome other ligamentary Expanſions belonging to the Bones of the Leg, but as they do not ſerve ſo much for the Connexion of the Bones, as to ſupport the Muſcles, the Deſcription of them as well as of the annular Ligaments, will more naturally come in, in the Treatiſe of the Muſcles.

*Marrow and mucilaginous Glands of the Bones of the Leg.*

184. The Marrow of theſe Bones lies in large Maſſes in the great Cavities, and in diſtinct Moleculæ in the ſpungy parts, as has been already obſerved in general.

185. The mucilaginous Glands lie in the ſmall Spaces, Depreſſions, and ſuperficial Notches near the Edges of the Cartilages of each Joint. They

are covered by the capſular Ligaments, and more or leſs mixed with a fatty Subſtance.

186. The Glands of the Knee, which lie near the Edges of the Patella, are the moſt conſiderable, being diſpoſed in form of Fringes, and ſupported by a great quantity of fatty Matter, which makes, in ſome meaſure, one Maſs with them.

187. This common Maſs is contained within the capſular Ligament, and on the ſide of the Joint is covered by a very fine Membrane, which likewiſe lines the inner Surface of the Ligament. The glandulous Subſtance is eaſily diſtinguiſhed from the Fat, by the reddiſh colour of the capillary Veſſels which ſurround the Glands.

188. The ſuperior Portion of this Maſs is as it were ſuſpended by the ſmall Ligament, fixed in the anterior part of the great common Notch of the Condyles of the Os Femoris, and which from thence runs to the upper part of the Patella, as has been already obſerved in the Deſcription of the Ligaments.

189. There are other mucilaginous Glands both above and below the Edges of the ſemilunar Cartilages.

190. And likewiſe in the Ham, ſome whereof ſerve for the Joint, the reſt, for the crucial Ligaments. Theſe laſt lie in folds formed by the internal Membrane of the capſular Ligament, which give particular coverings to the crucial Ligaments, and to the other bundles of ligamentary Fibres near them.

*Cartilages of the Bones of the Foot.*

191. The Aſtragalus is covered by three Cartilages. The firſt covers the three Surfaces, which make the convex part and ſides of the Pulley; the ſecond, the concave Surface of it's inferior part; and the third, the convex Surface of it's anterior part, being continued over the inferior part, ſo far as to form three other ſmall Surfaces, one of which is not articular in a ſtrict Senſe.

192. The firſt of theſe Cartilages is for the Articulation of this Bone with the Tibia and Fibula; the ſecond, for the Os Calcis; and the third, for the Os Scaphoides. Two of the inferior Surfaces formed by the continuation of the third Cartilage, are for the Articulation of this Bone with the Os Calcis; the third contributes to the Formation of a Channel for the Paſſage of a Tendon.

193. The Os Calcis has four Cartilages, of which three are ſuperior, one large and two ſmall for it's triple Articulation with the Aſtragalus; the fourth is anterior, for the Os Cuboides. To theſe muſt be added a ſmall thin Cartilage, of a kind of ligamentary Subſtance under the Tubercle on the outſide of this Bone.

194. The Os Scaphoides has two Cartilages, one poſterior for it's Articulation with the Aſtragalus; and one anterior divided into three parts for the three Oſſa Cuneiformia.

195. The Os Cuboides has two remarkable Cartilages, one poſterior for it's Articulation with the Os Calcis, and one anterior lying in two Planes for it's Articulation with the two laſt Metatarſal Bones. It has likewiſe a Car-

a Cartilage on the inſide for the Os Cuneiforme which is next to it, and one on the lower ſide, covering a part of the oblique Eminence ſituated there.

196. The three Oſſa Cuneiformia have each of them a poſterior Cartilage for their Articulation with the Os Scaphoides; and one anterior, for the three firſt Metatarſal Bones; they have likewiſe ſmall cartilaginous Surfaces on their lateral Sides, for their Articulations with each other; and beſides, the firſt and third Bones are joined thereby to the lateral parts of the Baſis of the ſecond Metatarſal Bone, and the third, to the Os Cuboides.

197. The Baſes and Heads of the Metatarſal Bones are covered with Cartilages.

198. The Phalanges have Cartilages in the ſame manner at their Baſes and Heads, except at the Heads or Extremities of the laſt.

199. The ſeſamoide Bones are covered with Cartilages on that ſide by which they ſlide on other Bones.

200. We ought to beware of confounding the Remains of Tendons, Ligaments, and Aponeuroſes with the true Cartilages, as for inſtance, at the poſterior part of the Os Calcis. I gave the ſame caution when I ſpoke of the Cartilages in general.

*Ligaments of the Bones of the Foot.*

201. The Foot being made up of many Bones, muſt beſides thoſe Ligaments by which it is tied to the Bones of the Leg, have ſeveral others to connect not only the three parts of which it is compoſed, but alſo the particular Bones belonging to each part.

202. I have already mentioned the Inſertions of three Ligaments in each Ankle, one anterior, one middle, and one poſterior, for the Articulation of the Ankles with the Foot.

203. The Ligaments of the inner Ankle are all fixed in the inſide of the Aſtragalus. The moſt anterior is pretty broad, and ſometimes ſeems to be joined in one with the middle Ligament. It often conſiſts of ſeveral diſtinct parts like ſo many Bands interlarded with Fat.

204. The anterior and middle Ligaments of the outer Ankle, being more or leſs broad, are fixed in the outſide of the Aſtragalus; the poſterior, which is narroweſt and pretty thick, is chiefly fixed in the outſide of the great Portion of the Os Calcis.

205. All theſe Ligaments lie on the outſide of the Capſula, which ſurrounds the Articulation of the Aſtragalus with the Bones of the Leg.

206. The Ligaments by which the Bones of the Tarſus are connected with each other, are ſhort, flat, of different breadths, and run from one Bone to another in various Directions. They are all ſuperficial, except one, by which the Aſtragalus is tied to the Os Calcis, and for the moſt part are either ſuperior or inferior, the lateral Ligaments being but very few in number.

207. Some of them are partly common to ſeveral Bones, and partly belong only to two; that is, the ſuperficial Strata of their Fibres run over one Bone into the following, and ſometimes further; but the Strata next the Articulation are generally confined to two Bones only.

208. The Aſtragalus is tied to the other Bones of the Tarſus, by ſeveral true Ligaments, *viz.*

209. To the inſide of the Os Calcis by a Ligament which comes from the poſterior internal Tuberoſity of the Body of the Aſtragalus, and is fixed in an inequality behind the lateral Apophyſis of the Os Calcis.

210. To the inſide of the ſame Bone by a Ligament which comes from the lateral Apophyſis of the Os Calcis, and is fixed in a ſort of Cartilaginous Production on the inſide of the Neck of the Aſtragalus.

211. To the outſide of the ſame Bone by two Ligaments which come from the Edge of the oblique inferior Depreſſion of the Aſtragalus, and afterwards ſeparating a little, are fixed in the outſide of the great Apophyſis of the Os Calcis, one forward which ſeems to ſend off a ſmall Portion to the Os Cuboides, the other backward of different breadths.

212. To the Os Scaphoides ſuperiorly by a Ligament which goes from the Neck of the Aſtragalus to the upper part of the Os Scaphoides, and from thence is extended to the middle of the Os Cuneiforme.

213. To the ſame Bone interiorly by two Ligaments, one of which is a Continuation of that which goes from the lateral Apophyſis of the Os Calcis to the Cartilaginous Production of the Aſtragalus; the other is near the ſame Production, being partly covered by the former, and fixed in the Tuberoſity of the Os Scaphoides.

214. To the Os Calcis, by a Ligament which comes from the oblique inferior Depreſſion of the Aſtragalus, and is fixed in the oblique ſuperior Depreſſion of the Os Calcis.

215. If to theſe principal Ligaments of the Aſtragalus, we add ſeveral others leſs remarkable, and alſo thoſe by which it is tied to the Ankles, their number will be very conſiderable.

216. The capſular Ligaments go very little further than the Edges of the Articulations of this Bone with the reſt. They adhere very cloſely to the true Ligaments, and are covered and hid by them.

217. The Os Calcis is joined to the outer Ankle and Aſtragalus by the Ligaments already deſcribed. It is likewiſe connected to the Os Scaphoides and Os Cuboides by ſeveral Ligamentary Planes.

218. It is connected to the Os Scaphoides; (1.) By a Continuation of the Ligament that goes from it's lateral or internal Apophyſis to the Cartilaginous Production of the Aſtragalus. (2.) By a Ligamentary Plane which goes from the inferior Tuberoſity of it's great Apophyſis, and is fixed in the inferior part of the Circumference of the Os Scaphoides. (3.) By a narrower Ligament which goes from the ſuperior and internal part of the ſame Apophyſis, and ends in the neareſt part of the Circumference of the Os Scaphoides.

219. It is connected to the Os Cuboides. (1.) By a Ligament, or rather by ſeveral ligamentary Faſciculi which go from the Extremity of it's oblique ſuperior Depreſſion to the contiguous Angle of the Os Cuboides. (2.) By one lying between the firſt, and the ſmall external lateral Tuberoſity of the Os Calcis, and inſerted in the Os Cuboides near the firſt.

(3.) By one which is fixed to the exterior and inferior part of the great Apophyſis of the Os Calcis, and to the contiguous part of the Os Cuboides. (4.) By a pretty broad Plane which covers the inferior part of the Os Calcis, and which from the anterior Tuberoſity of this part ſpreads over the contiguous inferior part of the Os Cuboides, and ends in the oblique Eminence of that Bone. (5.) By a broader Plane, which, having filled the lower part of the lateral Concavity of the Os Calcis, is chiefly inſerted in the contiguous Angle of the Os Cuboides.

220. The capſular Ligaments agree with thoſe of the Aſtragalus.

221. The Os Scaphoides is tied to the Aſtragalus and Os Calcis in the manner already ſaid.

222. It is likewiſe joined to the Os Cuboides and the Oſſa Cuneiformia by ſeveral Ligaments. On the outſide, or that next the Os Cuboides there is one which connects it to the contiguous Angle of that Bone. On it's upper part, two go from it's Circumference, one to the ſecond, the other to the third Os Cuneiforme. On it's interior Side, it is joined to the convex ſide of the great Os Cuneiforme by two Ligaments. On it's lower Side it has four, whereof the firſt appears as if it were double, going from the Tuberoſity of this Bone to the Baſis of the firſt Os Cuneiforme; the ſecond and third go obliquely to the other two Oſſa Cuneiformia; the fourth is a little tranſverſe, being fixed in the inferior internal Angle of the Os Cuboides.

223. The Os Cuboides, beſides the Ligaments which tie it to the Aſtragalus, Os Calcis, and Os Scaphoides already mentioned, has others which connect it above, below, and on the outſide with the third Os Cuneiforme and two laſt Bones of the Metatarſus. The ſuperior Ligaments are almoſt equally flat, the inferior unequally thick and ſtronger than the ſuperior. The exterior goes from the Os Cuboides to the Tuberoſity in the Baſis of the laſt Bone of the Metatarſus, and ſeems likewiſe to communicate with the third Bone by ſome ligamentary Fibres.

224. The three Oſſa Cuneiformia are fixed to the Os Scaphoides and Os Cuboides, by the Ligaments abovementioned. They are connected together on the upper Part by particular ligamentary Planes which go more or leſs tranſverſely from one Bone to another, being all joined to one common ligamentary Plane which covers theſe three Bones, and alſo the Os Cuboides. On the lower part they are joined by ſtronger and thicker Ligaments. They are likewiſe connected by Ligaments to the three firſt Bones of the Metatarſus.

225. The great Os Cuneiforme is joined on it's upper, lower, and interior or convex Side, to the Baſis of the firſt metatarſal Bone, by ligamentary Fibres, which form almoſt a continued Plane, the inferior part of which is ſtrong and thick, and appears to be double. It is likewiſe tied to the inſide of the Baſis of the ſecond metatarſal Bone, by a particular Ligament.

226. It has likewiſe on the outſide of it's inferior part, three conſiderable Ligaments more or leſs oblique; the firſt and ſhorteſt of which goes to the Baſis of the ſecond metatarſal Bone, the ſecond to that of the third, and the third, which is the longeſt, to that of the fourth.

227. The Bones of the Metatarſus are connected together by their Baſes and Heads. The Ligaments that go between the Baſes are ſuperior and inferior. The ſuperior are flat and ſmall: the inferior ſtrong and thick, and as it were multiplied by entering the Interſtices between the Baſes.

228. The Ligaments which go between the Heads have nearly the ſame general Diſpoſition. The inferior have this peculiar to them, that by filling the Spaces between the Heads, they keep them at ſome diſtance from each other. The inferior Portions of theſe Ligaments are fixed in the Angles, at the lower part of each Head. They are moreover ſtrengthened by their Union and Intertexture with the Aponeuroſis Plantaris, as ſhall be ſaid hereafter.

229. The firſt Phalanges of the Toes are tied to the Heads of the metatarſal Bones, by a ſort of orbicular Ligament, ſet round the Edges of the cartilaginous Portions of the Head, and thoſe of the Baſes of the Phalanges.

230. In the four Toes, next the great Toe, the inferior part of theſe Ligaments is very thick, and cruſted over as it were with a cartilaginous Subſtance fixed to the Baſis of the Phalanges, and from thence continued over the Head of the metatarſal Bone next it. This Subſtance grows hard with Age, like a ſeſamoide Bone.

231. Of theſe ſeſamoide Bones, the Great Toe has two belonging to the firſt Phalanx, which are the largeſt, the ſooneſt formed, and moſt conſiderable of all that go by that Name. They are ſhaped like an Olive, being about one third part of an Inch in length, and about half as broad as long. They are joined by their anterior Extremities, to the Baſis of this Phalanx, cloſe by each other, and lie in the two Depreſſions, on the lower ſide of the Head of the firſt metatarſal Bone.

232. The ſecond and third Phalanges of all the Toes being articulated by Ginglymi, have lateral Ligaments, which go between the Sides of the Baſes, to the Sides of the Heads. At the inferior Edges of all theſe Baſes, there is a cartilaginous Matter, joined to the Ligaments, which hardens with Age, in the ſame manner as thoſe of the firſt Phalanges.

233. The capſular Ligaments of all theſe Articulations are diſpoſed in the ſame manner as in the firſt Bones of the Tarſus already deſcribed.

234. The annular Ligaments and ligamentary Vaginæ, found on the Surface of many of theſe Bones, contribute nothing to their Connexion, and therefore ſhall be explained in another place.

*Perioſteum, Marrow, and mucilaginous Glands of the Bones of the Foot.*

235. The Perioſteum, which covers all theſe Bones, is of the ſame kind with that of the Bones of the Leg.

236. The Marrow is ſuitable to their internal Structure, that is, in Moleculæ in the cavernous Portions, and in Maſſes in thoſe which have large Cavities. Thus the Marrow of all the tarſal Bones is diſperſed in Moleculæ, becauſe their internal Structure is ſpungy. In the metatarſal Bones and firſt Phalanges of the Toes, it is diſpoſed in the ſame manner as in the Tibia and Fibula, that is, it lies in Moleculæ in the Extremities, the Structure of which is Cavernous; but in the middle Portions of them it lies in Maſſes greater or

leſs, according to the Size of the Cavities. In the other Phalanges, which are intirely ſpungy, it is accordingly diſpoſed in Moleculæ.

237. The mucilaginous Glands anſwer in number and figure to the Depreſſions between the cartilaginous Edges and Ligaments.

### §. 2. *The freſh Bones of the upper Extremity.*

*Cartilages of the Bones of the Shoulder.*

238. The Scapula in many Subjects has a ſmall cartilaginous Border along it's whole Baſis, which in Children is remarkable enough, but in full grown Perſons it diſappears.

239. The Glenoide Cavity of this Bone is covered with a Cartilage, which is thicker toward the Circumference than in the middle, and a little raiſed above the Edge of the Bone. This Thickneſs of the cartilaginous Circumference makes the Cavity greater than it appears in the Sceleton; and ſometimes in place thereof there is an additional Border, which is thick at the Circumference of the Cavity, thin towards the bottom, and very narrow. It is of a pliable ſlippery Subſtance, yet ſomething different from that of a Cartilage, reſembling in ſome meaſure the Border of the cotyloide Cavity of the Os Innominatum.

240. The ſmall cartilaginous Surface of the Acromion, mentioned in the Treatiſe of dry Bones, is thicker in the natural State, and very little convex.

241. The ſmall triangular Surface, at the Extremity of the Spine of the Scapula, near the Baſis, is covered with a very thin ſmooth cartilaginous Lamina; but being tranſparent, it does not appear very white.

242. There are no other Cartilages commonly found in the Scapula, though we ſometimes obſerve in dry Bones ſeveral places which ſeem to have been Cartilaginous, but this is owing to the dried remains of Ligaments and Tendons.

243. The ſternal Extremity of the Clavicle is cruſted over with a Cartilage, which is a little convex, and covers it's whole triangular Surface; beſides which, it has another moveable common Cartilage, which ſhall be explained together with thoſe of the Sternum.

244. The ſmall cartilaginous Surface of the humeral Extremity of the Clavicle, anſwering to that of the Acromium, is much thicker in freſh than in dry Bones, and appears like that of the Acromium, to be a little convex.

245. Between theſe two Cartilages of the Clavicle and Acromium, there is in ſome Subjects a thin inter-articular Cartilage, very ſmooth on both ſides.

*Ligaments of the Bones of the Shoulder.*

246. The Articulation of the Acromium, with the Extremity of the Clavicle, is ſtrengthened quite round by ſeveral ſmall ſtrong Ligaments, which go from one Bone to the other. Theſe Ligaments lie very near each other, and are withal ſo tightly braced over the Joint, as to hide it altogether, and they appear more like a cartilaginous Covering, than a ligamentary Texture. The internal Surface of theſe Ligaments is lined with the Capſula of the Joint.

247. WHEN the ſmall inter-articular Cartilage is found, it's whole Circumference is connected to theſe Ligaments.

248. THE Articulation of the Clavicle with the Sternum, is ſuſtained by ſeveral Ligaments fixed by one end, round the pectoral Extremity of the Clavicle, near the Edge of the triangular Surface, and from thence paſſing over the inter-articular Cartilage, are inſerted by the other end in the Sternum, in the manner hereafter to be related.

249. THERE is a long, narrow, ſtrong Ligament, which goes from one Clavicle to the other, behind the Furea of the Sternum, being fixed to the internal Angle of the contiguous Extremities of the Bones. It may be called the inter-clavicular Ligament.

250. THE Neck of the Scapula, at a ſmall diſtance from the Edge of the glenoide Cavity, gives inſertion to the capſular Ligament or mucilaginous Bag, and to the articular Ligaments of the Joint of the Scapula and Os Humeri.

251. BESIDES theſe articular Ligaments of the Scapula, there are three ligamentary Cords fixed to the Tuberoſity of the Coracoide Apophyſis, two of which, by their other Extremities, are inſerted in the oblique Eminence on the lower Side of the humeral Extremity of the Clavicle; the third, under the Acromium. There is likewiſe a thin flat broad Ligament, reaching between the Criſta of the Spine of the Scapula, and the Edge of the inferior Coſta.

*Cartilages of the Os Humeri.*

252. THE Cartilage by which the Hemiſphere of the Head of the Os Humeri is covered, is gradually thicker toward the middle than toward the Edges.

253. THE four Surfaces of the Tuberoſities which appear Cartilaginous in dry Bones, ſerve only for the Inſertion of the Tendons of four Muſcles which move the Os Humeri on the Scapula.

254. THE Channel or Sinus, between the two Tuberoſities, is partly covered by a thin Cruſt, which appears rather Ligamentary than Cartilaginous, and partly by a tendinous Stratum, of which hereafter.

255. THE Trochlea and ſmall Head of the lower Extremity of the Os Humeri are covered by a common Cartilage in which the ſame proportion of Thickneſs is obſervable, as in that of the upper Extremities. This holds pretty generally of all the convex articular Cartilages.

256. THE Foſſulæ near the Pulley and ſmall Head are covered with a kind of thin cartilaginous or ligamentary Varniſh.

*Ligaments of the Os Humeri.*

257. THE capſular or mucilaginous Ligament looſely ſurrounds the whole Articulation of the Scapula with the Head of the Os Humeri. From it's Inſertion round the Edge of the glenoide Cavity already mentioned, it is continued over the Hemiſphere of the Head of the Os Humeri, and fixed near it's Edges, towards the muſcular Surfaces of the great and ſmall Tuberoſities.

258. AFTERWARDS parting from them on both ſides, in the large Space left between the two Tuberoſities, that is, between the ſmall Tuberoſity and the loweſt Surface of the great Tuberoſity, it runs down gradually

on the Neck of the Bone below the loweſt part of the cartilaginous Hemiſphere.

259. In all this courſe, the Capſula is cloſely fixed in the Bone, except in the ſmall Space left between the two Tuberoſities, that is, at the Channel or Sinus already mentioned; where it forms a Production like the Tube of a Funnel, proportioned to the Capacity of the Channel, and ſtrongly fixed in the upper Portion thereof. This membranous Tube is the Vagina of the inter-articular Tendon of the Biceps, which ſhall be deſcribed in the Treatiſe of the Muſcles.

260. The true Ligament of this Joint is in ſome meaſure of that kind mentioned No. 37, 38. that is, which ſeem to be made up of two ſorts of Ligaments cloſely united together, *viz.* of a capſular Ligament which ſurrounds the whole Articulation, and of ſeveral true Ligaments which run over, and cloſely adhere to the former at different diſtances.

261. Thus the Capſula or mucilaginous Bag of this Articulation is in part ſtrongly united to four flat Tendons inſerted in the two Tuberoſities; and in part covered by true ligamentary Bands which between the four Tendons and on both ſides of the firſt and laſt, form a conſiderable thickneſs. The reſt of the Space between the firſt or ſuperior Plane of the great Tuberoſity, and the ſmall Tuberoſity is ſo little provided with ligamentary Fibres, that it has been believed to be altogether without them; and Anatomiſts have ſatisfied themſelves with telling us, that in theſe places the orbicular Ligament is very rough on the outſide, but ſhining and ſmooth on the inſide.

262. The inter-articular Tendon of the Biceps which has been already mentioned in ſpeaking of the Production of the capſular Ligament of the Head of the Os Humeri, and which is contained in the Articulation much after the ſame manner as the inter-articular Ligament of the Head of the Os Femoris, called improperly Ligamentum Teres, might be properly enough deſcribed in this place, but I chooſe to refer it to the Muſcles.

263. On the Body of the Os Humeri, there are two particular Ligaments which I term inter-muſcular or lateral, of the ſame kind with thoſe mentioned, No. 52. They are long, flat, thin, ſtrong, and narrow, fixed by one Edge along the two lower thirds of the Bone and reaching to both Condyles. They are braced pretty tight, and are very narrow at the upper part, but broader toward the Condyles.

264. The lower Extremity of the Os Humeri is joined to the Bones of the Fore-Arm by two Faſciculi of ligamentary Fibres, one fixed to the internal Condyle, the other to the external. Each Faſciculus is compoſed of Fibres cloſely joined together at the Condyle, and afterwards parting in diſtinct Bands like a Gooſe's Foot.

265. The capſular Ligament is fixed to the Condyles, and there covers them; and afterwards it is fixed round both ſides of this lower Extremity above the Foſſulæ. It's Inſertion in theſe ſides is Arch-wiſe, ſo that it is there at a much greater diſtance from the Articulation than at the Condyles. The Foſſulæ are ſlight varniſhed over with a cartilaginous Subſtance.

266. This Capſula appears to be ſtrengthened by a ligamentary Web, the Fibres whereof croſs each other in different Directions; but we muſt not take for ligamentary Filaments, ſome tendinous Fibres of Muſcles to which the Capſula adheres very cloſely. It appears larger and looſer when the Muſcles are ſeparated from it, than in it's natural State when cloſely united to the Muſcles.

*Cartilages of the Bones of the Fore-Arm.*

267. The two ſigmoide Cavities in the upper Extremity of the Ulna are covered by a Cartilage common to both, which is a little interrupted about the middle of the Edges of the Cavities by the tranſverſe Notches mentioned in the Treatiſe of dry Bones. This cartilaginous Cruſt ſeems to be thicker at the Edges than in the middle.

268. The inferior Extremity or ſmall Head of the Ulna is cruſted over by a Cartilage, round it's cylindrical Border, in the Notch near the ſtyloide Apophyſis, and for ſome ſpace on the Apophyſis itſelf.

269. The Cartilage, which covers the Head of the Radius, is likewiſe ſtretched over the cylindrical Border thereof; and a lateral Portion of the muſcular Tuberoſity immediately below the Neck, is alſo covered with a thin ſhining Cartilage.

270. All the concave ſide of the Baſis of the Radius is cartilaginous, and often divided by a ſmall cartilaginous prominent Line. The lateral Notch of the Baſis is likewiſe covered by a continuation of the ſame Cartilage.

271. The lateral Half-Grooves or Channels of the Baſis of this Bone appear likewiſe to be cruſted over with a cartilaginous Matter; but this I rather take to be Portions of the annular Ligaments, which ſhall be hereafter deſcribed.

272. At the Baſis of the Radius there is likewiſe a particular additional Cartilage, or triangular Production longer than it is broad, very thin, and rather flat than concave on both it's ſmooth Sides. It is fixed by it's Baſis, or ſhorteſt Side, to the lateral ſigmoide Notch of the Baſis of the Radius, in ſuch a manner as that one Side of it is on a level with the large cartilaginous Surface of the Baſis of the Bone, and it's Apex directly oppoſite to the ſtyloide Apophyſis. The other ſide touches the flat Extremity of the ſmall Head of the Ulna, but is not fixed to it.

273. This Cartilage is one of thoſe mentioned, No. 26, 27. and may be termed the inter-articular Cartilage of the Joint of the Wriſt. It is tied to the Radius by very ſhort Ligaments, and ſliding on the ſmall Head of the Ulna, it follows all the Motions of the Radius. It is therefore a ſort of articular Production of the lower ſide of the Baſis of the Radius, and fills in the natural State, the void Space which in the Sceleton appears between the end of the Ulna and the neighbouring Bone of the Carpus.

*Ligaments of the Bones of the Fore-Arm.*

274. Some of the Ligaments of the Bones of the Fore-Arm are common to them with the Os Humeri, ſome common to them with the Bones of the Hand, and ſome are proper. Theſe laſt are two in number, one called the interoſſeus Ligament of the Fore-Arm, and one which may be termed the coronary Ligament of the Radius. To theſe may be added the

annular Ligaments, which only ſerve for the Paſſage of Tendons; and other ligamentary Expanſions, which may be called muſcular Ligaments.

275. THE interoſſeus Ligament of the Fore-Arm is very like that of the Leg. It is fixed by one Edge along the ſharp Angle of the Ulna, and by the other along that of the Radius. It is principally made up of two very ſtrong Planes of Fibres, which croſs each other at oblique Angles, and leave Holes at different Diſtances for the Paſſage of the Blood-Veſſels.

276. THIS Ligament ties the two Bones cloſely together, and the two Planes ſerve for the Inſertion of ſeveral Muſcles. In the Supination of the Hand it is very tightly braced, but in Pronation it is folded a little length-wiſe.

277. THE coronary Ligament of the Radius is a ſort of ligamentary Hoop ſurrounding the circular Circumference of the Head of that Bone, reaching from one ſide of the ſmall lateral ſigmoide or tranſverſe Cavity of the Ulna, to the other, in an Arch, which is about three quarters of a Circle. It is very ſtrong, and comes near the Solidity of a Cartilage. The ſide next the Radius is very ſmooth, and though it connects that Bone very cloſely to the Ulna, yet it leaves it room enough to turn in the Motions of Pronation and Supination.

278. THE capſular Ligament of the Joint of the Elbow runs down from it's Inſertion in the Os Humeri already deſcribed, and is fixed in the Olecranum round the Edge of the great ſigmoide Cavity, including both the Apex of the Olecranum and of the coronoide Apophyſis. It likewiſe runs over the Head of the Radius, and is fixed to the coronary Ligament, quite round. Thus it completely ſurrounds the Articulation of theſe three Bones, and ſerves to contain the mucilaginous Liquor furniſhed by the Glands and fatty Subſtance, both which are found in the greateſt Quantities near the Extremity of the Ulna.

279. THE true common Ligaments by which the Os Humeri is connected to the Bones of the Fore-Arm, called lateral Ligaments, are the two Faſciculi, which after being inſerted in the Condyles of the Os Humeri are expanded like a Gooſe's Foot. That which is fixed in the inner Condyle, may be called Brachio-Cubitale, and the other Brachio-Radiale.

280. THE Brachio-Cubital Ligament running down over the Capſula to which it cloſely adheres, below the great Edge of the Trochlea of the Os Humeri, is inſerted like Radii (of which it's other Extremity fixed in the Condyle is the Center) on the ſide of the great ſigmoide Cavity of the Ulna. It is covered on the outſide by ſeveral Tendons which adhere cloſely to it, and ſeem to ſtrengthen it.

281. THE Brachio-Radial Ligament is diſpoſed much after the ſame manner, but is of a greater Extent. It is expanded from the external Condyle of the Os Humeri, as from a Center, and is inſerted round the coronary Ligament, and from thence all the way down to the Neck of the Radius, and alſo in the neighbouring parts of the Ulna. Through all this

Paſſage, it covers the capſular Ligament, and is covered by ſeveral Tendons, adhering cloſely to both.

282. Of the Ligaments by which theſe Bones are connected to thoſe of the Hand, one is, like a roundiſh Cord, fixed in the ſtyloide Apophyſis of the Ulna, and from thence paſſes directly over the Os Cuneiforme of the Carpus, in which and in other Bones it is inſerted in the manner that we ſhall afterwards explain: another pretty broad Ligament is fixed in the Point of the Radius, and by it's other Extremity in the Bones of the Carpus.

283. From this ſtyloide Ligament of the Radius, along each Edge of the Baſis of that Bone, are ranks of ligamentary Fibres lying much in the ſame Direction with the Ligament itſelf, and continued all the way to the ſtyloide Ligament of the Ulna; thoſe neareſt the Ulna incloſe the inter-articular Cartilage of the Baſis of the Radius, and near the ſtyloide Ligament of the Ulna, there is a particular Faſciculus inſerted in the Point of that Cartilage.

284. All theſe Ligaments ſurround and cover the capſular Ligament ſo cloſely, that they can hardly be diſtinguiſhed from it. The Capſula is likewiſe in part covered by a Portion of a great oblique Ligament, which being by a very broad Inſertion fixed in the large Extremity of the Radius, about two fingers breadth above the ſtyloide Apex, afterwards croſſes obliquely, partly over the convex ſide of the Baſis Radii, and partly over that of the Carpus, and then turning toward the Os Orbiculare, is inſerted therein. It is called the external tranſverſe Ligament of the Carpus; and may likewiſe be named the great oblique Ligament of the Wriſt.

285. There are ſeveral ſmall annular Ligaments placed at different diſtances on the convex ſide of the Baſis Radii, from it's ſtyloide Apex to it's Articulation with the Extremity of the Ulna. They are at leaſt ſix in number, ſome of them being often double or triple.

286. The firſt is fixed in the ſtyloide Apex; the ſecond in the Groove near that Apex; the third in the ſmall narrow or middle Groove; the fourth in the Groove next the former; the fifth in the corner of the ſemilunar Notch of the Baſis, at it's Articulation with the Ulna; and the ſixth in the Extremity of the Ulna near the ſtyloide Apophyſis.

287. These particular Ligaments are almoſt wholly covered by the great oblique Ligament already mentioned, and are fixed as ſtrongly in it by one ſide, as they are in the Bones, by the other. They are all very ſtrong, and their concave ſides ſerving for Fræna to the Tendons of ſeveral Muſcles that paſs over them, are very ſmooth, and accompanied with thin mucilaginous Vaginæ, which ſhall be deſcribed in the Treatiſe of the Muſcles.

288. To theſe we might add the ligamentary Expanſions, with which ſeveral Muſcles are covered, and ſeparated from each other, as by ſo many diſtinct Septa, which are all very thick and ſtrong, where they are inſerted in the Bones. One kind of them may be termed ligamentary Bands or muſcular Vaginæ, the other ligamentary Septa, inter-muſcular Ligaments, *&c.* but the Deſcription of them muſt be referred to that of the Muſcles.

289. All the Bones of the Carpus, Metacarpus, and Fingers are cruſted over with Cartilages at theſe places, which I termed cartilaginous Surfaces in the Treatiſe of dry Bones; but in freſh Bones they are thicker, ſofter, and whiter than in the Sceleton. In adult Subjects, their figure remains the ſame in both, but it changes in the dry Bones of younger Subjects, and in thoſe of Children it is quite different. The Impreſſions and Notches in which the mucilaginous Glands are lodged, are moſt ſenſible in the Cartilages of freſh Bones, becauſe of their thickneſs. *Cartilages of the Bones of the Hand.*

290. The Ligaments of the Carpus are very numerous. Some of them tie each Bone to one or two neighbouring Bones in the ſame Rank; and theſe are compoſed of a great number of Filaments, but ſo very ſhort as to allow theſe Bones only a ſmall degree of Motion. Some of them tie the Bones of one Row to thoſe of the other; which are likewiſe made up of many Filaments, but not ſo ſhort as the former, and therefore allow theſe Bones a more manifeſt Motion, as we ſee in bending the Wriſt. Laſtly, there are other Ligaments of the Carpus, by which the three firſt Bones of the firſt Row are connected to the Bones of the Fore-Arm; and to theſe may be added the Ligaments by which the Bones of the ſecond Row are joined to thoſe of the Metacarpus and firſt Phalanx of the Thumb. *Ligaments of the Bones of the Hand.*

291. We have already deſcribed all the Ligaments belonging to the Articulation of the Carpus with the Bones of the Fore-Arm, except their Inſertions in the Carpus. The ſtyloide Ligament of the Radius is fixed round the neighbouring Tuberoſity of the Os Scaphoides. The ſtyloide Ligament of the Ulna is fixed firſt in the Os Cuneiforme, and then in the Os Unciforme, from whence it is a little ſtretched over the fourth Bone of the Metacarpus.

292. The Ligaments which lie between the two former, round the Baſis of the Radius, and a ſmall Portion of the Head of the Ulna, are fixed round the common Convexity of the three firſt carpal Bones, as is alſo the mucilaginous Capſula by which theſe Ligaments are lined.

293. Besides all theſe ſmall ſhort Ligaments belonging to each Bone in both Rows, the rough Surfaces of all the Bones, eſpecially thoſe which form the Convexity of the Carpus, give Inſertion to a great many ligamentary Faſciculi, ſtretched over and cloſely united to the former ſmall Ligaments, and ſerving probably to ſtrengthen them. Some Faſciculi of the ſame kind are found on the concave ſide of the Carpus, but they are fewer in number, and not ſo ſtrong.

294. There is likewiſe a conſiderable Ligament, called the inner tranſverſe Ligament of the Carpus. It was formerly called an annular Ligament, and may ſtill very juſtly retain that name, in the ſenſe already explained when I ſpoke of Ligaments in general.

295. The Bones of the Metacarpus, beſides the ſhort Ligaments by which they are tied to the ſecond Row of the Bones of the Carpus, have ſeveral others, by which both their Baſes and Heads are connected together. The Baſes of the third and fourth Bones are not ſo cloſely tied as the reſt,

and therefore they have a very ſenſible Motion, which, however, is greater in the fourth than in the third.

296. THE Heads of theſe Bones are firmly tied to each other by a ſtrong tranſverſe Ligament ſituated in the Palm of the Hand, and fixed by diſtinct Productions in the neighbouring part of the Heads, in ſuch a manner as to form in the Spaces between the Heads, a kind of perforated Fræna through which the Tendons of the Flexor Muſcles of the Fingers have a free paſſage; and theſe Fræna are alſo ſupported by aponeurotic Expanſions, which ſhall be deſcribed in the Treatiſe of the Muſcles.

297. THE firſt Phalanx of the Thumb is fixed to the Os Trapezium, by ſhort Ligaments which paſs obliquely over the Articulation. The firſt Phalanges of the other four Fingers are joined to the Heads of the metacarpal Bones almoſt in the ſame manner, and by Ligaments like the former, which are ſtrengthened by adhering to the tranſverſe Ligament already mentioned. The ſecond Phalanx of the Thumb is joined to the firſt by Ligaments of the ſame kind.

298. THE third Phalanx of the Thumb is joined to the ſecond; the ſecond Phalanges of the other Fingers to the firſt, and the third to the ſecond, by lateral Ligaments almoſt in the ſame manner as the Bones of the Fore-Arm to the Os Humeri; that is, theſe Ligaments ſpread from a Point fixed in the lateral Tubercles of the Heads of the Phalanges, and are inſerted by their other Extremity like Radii in the Baſes of the neighbouring Phalanges.

299. THE two firſt Phalanges of each Finger have a very ſtrong ligamentary Vaginæ inſerted in the rough Lines or Ridges on their flat Sides. Theſe Vaginæ are lined with a mucilaginous Membrane, which runs like a Tube from one Phalanx to the other, over the Articulation. They ſerve for Fræna to the Flexor Muſcles of the Fingers, the Tendons of which paſs through them.

## §. 3. *The freſh Bones of the Trunk.*

*Cartilages of the Spine.*

300. THE Cartilages of all the Vertebræ in general are of two kinds, one proper to each Vertebra, the other common to the two Vertebræ that lie next each other. The firſt I term Cartilages of Articulation, the others, Cartilages of Symphyſis.

301. THE proper articular Cartilages of each Vertebra of the whole Spine are thoſe four which cover the Surfaces of the four ſmall articular Apophyſes. In the natural State they are very white and ſmooth, and much thicker than in dry Bones. Their Circumference is the ſame with that of the articulated Sides of the Apophyſes, except in thoſe places where there are ſmall ſuperficial Notches. In the firſt Vertebra of the Neck and Vertebræ of the Loins, theſe Cartilages are thicker than in the reſt.

302. THE two inferior articular Cartilages of the firſt Vertebra, and the two ſuperior Cartilages of the ſecond, ſeem to be diſproportionate,

though not ſo much as in dry Bones; and in ſome Subjects we find moveable or inter-articular Cartilages between the Apophyſes of theſe two Vertebræ.

303. The firſt Vertebra of the Neck has a ſmall cartilaginous Incruſtation in the middle of the concave Side of it's anterior Arch, anſwering to another on the foreſide of the odontoide Apophyſis of the ſecond Vertebra; ſo that theſe two Vertebræ have five articular Cartilages each, beſides the inter-articular ones already mentioned.

304. The Vertebræ of the Back, beſides the four Cartilages of their ſmall Apophyſes, have others which do not belong to their Articulations with one another, *viz.* thoſe that cover the lateral Foſſulæ in the Bodies of theſe Vertebræ and the Foſſulæ of their tranſverſe Apophyſes, by both which they are articulated with the Ribs.

305. The Cartilages of Symphyſis lie between the Bodies of the Vertebræ, one of them being contained between, and cloſely joined to the lower Surface of the Body of one Vertebra, and to the upper Surface of that next under the former; the Breadth and Circumference of them anſwering exactly to that of the Surfaces to which they are connected; but their height or thickneſs is different in each Claſs of the Vertebræ. In the Vertebræ of the Loins they are a quarter or third part of an Inch in thickneſs, according to the Stature of the Subject. In thoſe of the Neck, they are not ſo thick, and the thinneſt of all are thoſe of the Vertebræ of the Back.

306. These Cartilages are not of an equal thickneſs in all their parts. Thoſe of the Neck and Loins appear to be thickeſt on the fore-ſide, and thoſe of the Back, rather thickeſt on the back-ſide; but theſe differences are moſt remarkable in the Vertebræ that lie near the middle of each Claſs.

307. The internal Structure of theſe Cartilages is different from that of all the other Cartilages of the Body, and indeed they reſemble the reſt in nothing but in whiteneſs and elaſticity. When we view their Circumferences only, they ſeem to be one uniform Maſs as the others generally are, but when they are divided by an inciſion parallel to the Surface of the Vertebræ to which they are joined, we ſee that they are made up of a great number of cartilaginous concentrical Rings contained within each other, a ſmall diſtance being left between them. They are cloſeſt and thinneſt near the Center, and about the middle ſeem to degenerate into another ſofter kind of Subſtance.

308. These Rings do not form an intire Circumference, being turned inward on the back-ſide, anſwerably to the poſterior ſlope in the Body of each Vertebra. They lie Horizontally, one Edge being fixed to the lower ſide of one Vertebra, and the other to the upper ſide of the Vertebra next below the former. The Interſtices between the Rings are filled with a mucilaginous Subſtance, leſs fluid than that of the Joints; and their

breadth or height is proportionable to the diſtance of the Vertebræ between which they lie.

309. EACH cartilaginous Lamina taken ſeparately is very pliable according to it's length, but taken all together, they are not ſo eaſily bent, partly becauſe of their circular figure, and partly becauſe of their Proximity and Multiplicity. They yield, however, in the Inflexions of the Spine; and their external Surface, which in the ordinary Situation of the Spine is even with the Surface of the Vertebræ, becomes prominent, or jets out on that ſide toward which the Inflexion is made, the Cartilages being then compreſſed by the Vertebræ.

310. THEY likewiſe yield on all ſides without any Inflexion of the Spine, to the weight of the Head and upper Extremities; but this is done by very ſmall and imperceptible degrees, and moſt of all, when the upper parts of the Body are loaded with any exterior weight.

311. THEY reſtore themſelves afterwards merely by being freed from Compreſſion; ſo that a Man is really taller after lying ſome time, than after he has walked or carried a Burden for a great while: the moſt natural and ſimple Reaſon that can be given for the different heights of the ſame Perſon at different times, firſt obſerved in *England*, and afterwards confirmed by M. *Morand*, a Member of the Royal Academy of Sciences, being the different State of the inter-vertebral Cartilages.

312. THE inter-vertebral Cartilages of the Neck, lying for the moſt part between the convex ſide of one Vertebra, and the concave ſide of another, are of a greater extent in proportion to the ſize of theſe Vertebræ, than thoſe of the Back and Loins. Without this convexity and hollowneſs in theſe Vertebræ, which are the leaſt of all, the Cartilages could not have been made large enough to be able to reſiſt Strains and great Motions.

313. THE Os Sacrum has no Cartilage except that between the upper ſide of the firſt falſe Vertebra, and the laſt Vertebra of the Loins, and thoſe by which it is connected with the Oſſa Innominata, already deſcribed.

314. THE inter-vertebral Cartilages of this Bone in an adult Subject are too much obliterated to need a Deſcription.

315. THE Cartilages which join the different Portions of the Os Coccygis are preſerved in ſome Subjects, to a very great Age; in others they ſoon become intirely bony.

*Ligaments of the Spine.*

316. THE Vertebræ are ſtrongly connected to each other by three kinds of Ligaments. Each Vertebra is connected to that above and below it, by a great number of very ſhort and ſtrong Ligaments which croſs each other obliquely, and are fixed round the Edges of the Body of each Vertebra.

317. THESE crucial Ligaments cover the Circumference of the inter-vertebral Cartilages, and adhere cloſely to them. They ſeem to be looſer in the cervical and lumbar Vertebræ than in thoſe of the Back, and by

that means yield to the Cartilages in the different Inflexions of the Spine already mentioned.

318. The Bodies of all the Vertebræ, from the ſecond of the Neck to the Os Sacrum, are covered by ligamentary Half Vaginæ on the convex ſide, in which theſe Vaginæ are fixed, ſurrounding all the crucial Ligaments, and made up of ligamentary Faſciculi and Filaments, partly oblique, but moſtly longitudinal.

319. All the Vertebræ are likewiſe ſtrongly connected by a ligamentary Tube, which lines the inner Surface of the medullary Canal from the occipital Hole, to the Os Sacrum, repreſenting a kind of long flexible Funnel, it's Cavity at the upper part being equal to that of the occipital Foramen; and ending in a ſmall Point at the Os Sacrum.

320. This Ligament is made up of ſeveral Strata of longitudinal and oblique Fibres interwoven together, adhering cloſely to the inſide of the great Foramen in each Vertebra, by a great number of Filaments detached from it to the porous Subſtance of the Vertebræ.

321. The firſt Vertebra is not only fixed to the Os Occipitis by a Portion of this ligamentary Funnel, but alſo by a diſtinct and very ſtrong ligamentary Covering, which ſurrounds and adheres very cloſely to that Portion of the Funnel. This Covering is fixed above, round the great occipital Foramen, where it begins to adhere to the Funnel, and below, quite round the Circumference of the firſt Vertebra.

322. The ſecond Vertebra has two Ligaments peculiar to it, one which connects the Apophyſis Dentiformis to the Os Occipitis; and another tranſverſe, which confines this Apophyſis within the anterior Portion of the Cavity of the firſt Vertebra. The firſt may be termed the Occipital, and the ſecond the tranſverſe Ligament of the odontoide Apophyſis.

323. The occipital Ligament is very ſtrong and thick, and adheres in a very ſingular manner to the three Planes of the Apex of the Apophyſis, and is afterwards divided into two or three Portions which are fixed in the like manner, in the anterior Edge of the great occipital Foramen, and in the Inequalities of the Apophyſis Baſilaris near that Hole.

324. The tranſverſe Ligament may be ſaid more juſtly to belong to the firſt Vertebra, both ends of it being inſerted in the lateral Impreſſions of the inner Surface of that Vertebra mentioned in the Deſcription of the Sceleton. But it is ranked among the Ligaments of the ſecond Vertebra, becauſe of it's uſe, and becauſe of the Inſertion of it's middle Portion.

325. This thick Ligament is ſtretched from one ſide of the inner Surface of the firſt Vertebra, to the ſecond. About the middle of the foreſide, it's texture is very cloſe, and it is fixed by this Portion in the back part of the Apophyſis Dentiformis; and ſometimes it ſeems to have additional Faſciculi which adhere by one end to both Extremities, and by the other, to each ſide of the Apophyſis.

326. Along the whole bony Canal of the Spine, between the Baſes of each ſpinal Apophyſis, lies a flat and very elaſtic Ligament of a yellowiſh colour, which fills up the poſterior great Notches of the Vertebæ, adhering to their Edges; and likewiſe to the neighbouring Portions of the Funnel or great ligamentary Tube.

327. Between the Extremities or Apices of the ſpinal Apophyſes, we find ſmall ligamentary Ropes which go from one Spine to that next it; and which are really double, though they ſeem to be ſingle in the Vertebræ of the Back and Loins. In the Vertebræ of the Neck, they are fixed ſeparately to the forked Extremities of the Spines.

328. Between all the ſpinal Apophyſes, from their Apices to the middle of the Baſes, lies a ligamentary Membrane going between each two Apophyſes, and thereby diſtinguiſhing the right Side of the Vertebræ from the left. There is a Ligament of the ſame kind between the tranſverſe Apophyſes.

329. These are inter-muſcular Ligaments or ligamentary Septa, which divide the Muſcles of one ſide from thoſe of the other, as was already obſerved in ſpeaking of the Ligaments in general, and will appear more particularly in the Deſcription of the Muſcles. The firſt kind may be termed Inter-Spinales, the other Inter-Tranſverſales.

330. The articular Ligaments of the Spina Dorſi, are thoſe which tie the glenoide Cavities of the firſt Vertebra to the Condyles of the Os Occipitis; thoſe that join the cartilaginous Surface of the Apophyſis Dentiformis, to the anterior Cavity of the firſt Vertebra; and thoſe by which all the oblique or articular Apophyſes are connected together.

331. These are all ſmall, ſhort, ſtrong ligamentary Faſciculi, fixed by both Extremities, round the cartilaginous Surfaces of the Apophyſes, ſurrounding very cloſely all the capſular Ligaments of theſe Articulations.

332. The vertebral Ligaments of the Ribs, or thoſe which connect the Ribs to the Bodies and tranſverſe Apophyſes of the Vertebræ of the Back, are of the ſame kind, being inſerted round the cartilaginous Foſſulæ, in the Body and Apophyſes of each Vertebra.

333. Besides all theſe Ligaments of the Spina Dorſi, there is one which goes in form of a Membrane, from the Os Occipitis, all the way to the laſt two Vertebræ of the Neck. It is broad at the upper part, and from thence diminiſhes gradually. By it's upper broad Extremity, it is fixed along the occipital Spine, and by one Edge, in the poſterior Tubercle of the firſt Vertebra, between the two ſpinal Furcæ of the following Vertebræ, and in the Apices of the ſpinal Apophyſes of the loweſt Vertebræ; but the other Edge is looſe. This is a true inter-muſcular Ligament, and I give it the name of Ligamentum Cervicale Poſterius.

334. There are two lateral Ligaments of the ſame kind fixed to the tranſverſe Apophyſes of the Vertebræ of the Neck, which ſhall be deſcribed together with the Muſcles.

335. The Ligaments belonging to the Os Sacrum were deſcribed near the beginning of this Account of the freſh Bones.

336. The Sternum of an adult Subject has commonly ſixteen Cartilages, fourteen of which are Articular, the other two Symphyſes. Of the articular Cartilages, two belong to the Articulations of the Clavicula, and twelve to thoſe of the true Ribs, from the ſecond to the ſeventh incluſively. The two Symphyſes are thoſe between the Sternum and the firſt Rib on each ſide.

*Cartilages of the Sternum and Ribs.*

337. There is likewiſe another Symphyſis by which the upper Portion of the Sternum is connected to the lower, the Cartilage of which is often obliterated in an advanced Age.

338. The Apophyſis Enſiformis is often bony toward the Sternum, and more or leſs cartilaginous at the other End. In very aged Perſons it has been found intirely oſſified; and ſometimes wholly cartilaginous, even in Adults.

339. All the Ribs have cartilaginous Portions which differ from each other in length, breadth, incurvation, adheſions, and in their extremities, all which were explained in the Deſcription of the Sceleton. We have only to obſerve here, that theſe Cartilages are whiter, more poliſhed, broader and thicker in the natural State than when they are dried.

340. The Cartilages of the falſe Ribs are naturally more ſlender and pliable than thoſe of the true Ribs, the middle or inner ſubſtance of which acquires the conſiſtence of Bones in old Age, and their Extremities ſometimes oſſify, and are immoveably fixed to the Sternum.

341. The Sternum has ſeveral Ligaments by which it is connected with the Clavicles and Ribs. It is joined to the Clavicles by ſtrong ſhort Ligaments, fixed by one Extremity round the Edges of it's two ſuperior Notches, by the other, in the Extremity of each Clavicle, and by the middle, to the inter-articular Cartilages already explained, ſurrounding the particular Ligaments which go between the Edges of theſe Cartilages and the Sternum; and the capſular Ligaments between them and the Clavicles.

*Ligaments of the Sternum and Ribs.*

342. All the Ribs are connected to the Bodies of the Vertebræ, by ſtrong ſhort ligamentary Faſciculi, fixed by one end round the Foſſulæ in the Vertebræ, and by the other, round the Head of each Rib. The Ribs are likewiſe tied to each other, by thin Ligaments which go obliquely from the Cartilage of each Rib to that of the next.

343. The ten uppermoſt Ribs on each ſide are connected to the tranſverſe Apophyſes of the Vertebræ of the Back, by ſtrong ſhort articular Ligaments fixed to the Tuberoſities of the Ribs, and round the Foſſulæ of the Apophyſes, much in the ſame manner with thoſe which go between the Heads of the Ribs and Bodies of the Vertebræ. Both theſe Articulations are provided with capſular Ligaments.

344. The eleventh Rib on each ſide, having no Articulation with the tranſverſe Apophyſes, is connected to them by auxiliary ſtrong ſhort Ligaments fixed in it's Neck.

345. The laſt Rib is only joined by it's Head to the Body of the twelfth Vertebra of the Back; but it is connected in a particular manner to the tranſverſe Apophyſis of the firſt Vertebra of the Loins, by a broad Ligament fixed in the whole upper Edge of the Apophyſes, and in the lower Edge of the Rib through about two thirds of it's length.

346. The firſt true Rib has no ligamentary Connexion with the Sternum, the cartilaginous Symphyſis being ſufficient. The reſt are cloſely joined to that Bone by ſmall ligamentary Portions fixed by one end round the Extremity of the Cartilage, and by the other, round the Notches in the Sternum. On the upper and lower Sides of each Articulation, theſe Ligaments are very ſhort, but on the foreſide they are expanded over the Sternum in a radiated manner.

347. The Cartilage of the firſt falſe Rib is joined to that of the laſt true Rib, by ſeveral ſhort Filaments, which go from the lower Edge of the one to the upper Edge of the other, near it's ſmall Extremity. The other falſe Ribs are connected together much in the ſame manner, with this difference only, that the Filaments by which the fourth Rib is connected to the third, are longer than thoſe above them; and thoſe between the fifth Rib and the fourth, much longer than any of the reſt: and for this reaſon theſe two Ribs are leſs ſteady than the others.

*The Perioſteum, Marrow and mucilaginous Glands of the Vertebræ, Sternum and Ribs.*

348. The ligamentary Expanſions of the Vertebræ are in place of a Perioſteum, both outwardly and inwardly. The Sternum and bony Portions of the Ribs have a Perioſteum like the other Bones. The cartilaginous Portions of the Ribs are covered by a Membrane of the ſame kind, termed Perichondrium. As the internal Structure of theſe Bones is cellulous or ſpungy, they contain only ſmall ſeparate Portions of Marrow, or a red medullary Juice, like that in the Vertebræ.

349. The mucilaginous Glands of all theſe Articulations are very ſmall, but are accompanied by many fatty Moleculæ lying round each Joint. The inner Surface of the ligamentary Tube which lines the bony Canal of the Spine, is lubricated by an oily or adipoſe Subſtance, which ſhall be ſpoken to in the Deſcription of the Brain.

## §. 4. *The freſh Bones of the Head.*

*Cartilages.*

350. The condyloide Apophyſes of the Os Occipitis, the glenoide Cavities or articular Foſſulæ of the Oſſa Temporum, the Eminences next theſe Cavities, and the condyloide Apophyſes of the lower Jaw, are all cruſted over with very white and ſmooth Cartilages; and there is likewiſe an inter-articular or moveable Cartilage in each Articulation of the lower Jaw, with the temporal Bones.

351. This Cartilage is thick near the Circumference, very thin and tranſparent, and ſometimes perforated in the middle. The lower Side is uniformly concave, anſwering to the oblong Convexity of the maxillary

Condyle; but the upper Side is partly concave and partly convex, ſuited to the Foſſula and Eminence in the temporal Bone. The Mechaniſm of this Cartilage ſhall be explained in the Deſcription of the Muſcles.

352. The remaining Cartilages of the Bones of the Head, *viz.* the cartilaginous Septum and other Cartilages of the Noſe; the ſmall cartilaginous Ring in each Orbit; the Cartilages of the outward Ear; and thoſe which are joined to the Os Hyoides, muſt be referred to the Deſcription of the Viſcera.

*Ligaments.* 353. The Ligaments of the Bones of the Head are theſe. (1.) Thoſe between the occipital Condyles and the ſuperior Apophyſes of the firſt Vertebra of the Neck. (2.) Thoſe between the Os Occipitis and Apophyſis Dentiformis of the ſecond Vertebra. (3.) Thoſe of the Articulation of the lower Jaw with the temporal Bones. (4.) Thoſe by which the Os Hyoides is connected to the ſtyloide Apophyſes. I here paſs over the Ligaments which connect the Cartilages of the Ear, thoſe of the Noſe, the ſmall cartilaginous Pulleys of the Orbits, and the ciliary Cartilages.

354 The Ligaments of the occipital Condyles reſemble the articular Ligaments of the Vertebræ, conſiſting of a ſtrong Texture of ligamentary Filaments placed cloſe by each other round the whole Articulation, and fixed by one end in the occipital Bone, by the other in the Edges of the ſuperior Apophyſes of the firſt Vertebræ, and ſurrounding the capſular Ligaments.

355. The Ligaments which go from the Os Occipitis to the Apophyſis Dentiformis, are very thick, and diſpoſed in ſeparate Faſciculi which afterwards unite. The Faſciculi are fixed immediately before the great occipital Foramen in the lower ſide of the Apophyſis Baſilaris, and the united Ligament is inſerted in the odontoide Apophyſis in the manner already ſaid.

356. The Ligaments of the Articulation of the lower Jaw are very ſtrong, and are diſpoſed and inſerted much in the ſame manner with thoſe by which the Clavicle is connected to the Sternum. They are fixed by one Extremity round the glenoide Cavity or articular Foſſula and Eminence of each temporal Bone, by their Middle, round the inter-articular Cartilage, and by the other Extremity, round each Condyle of the lower Jaw. The Diſpoſition of the capſular Ligament with reſpect to the inter-articular Cartilage is the ſame as in the Articulation of the Clavicle with the Sternum.

*Perioſteum, Marrow and mucilaginous Glands.* 357. The Bones of the Head, as well as all the other Bones of the Human Body, are covered by a particular Membrane, of which that part which belongs to the Scull, is termed Pericranium, and that which covers the Bones of the Face, or of the two Jaws, is called ſimply Perioſteum. This Membrane ſhall be more particularly deſcribed among the other ſoft parts of the Head.

358. The internal Structure of the Bones of the Head being for the moſt part cellulous, they contain alſo diſtinct Portions of Marrow included in membranous Cells lying in the Diploë.

359. The Sinus Frontales, Maxillares, and Sphenoidales, are lined with a glandulous Membrane which ſecretes a Mucilage very different from that of the Joints, as we ſhall ſee in another place.

360. The true mucilaginous Glands of the occipital and maxillary Articulations, have nothing peculiar to them. They are proportioned to the Joints to which they belong, and lie between the capſular Ligaments and Circumference of the Cartilages.

# SECT. III.

## *A Deſcription of the Muſcles.*

## ART. I.

### *The general Doctrine of the Muſcles.*

1. ALL the Motions of the human Body, whether general or particular, whether natural or preternatural, are immediately performed by Organs which Anatomiſts name Muſcles; and theſe are found in all the moveable parts of the Body. I do not here ſpeak of motions cauſed merely by the elaſticity of certain parts, by external impulſes, or by the force of Gravity. *Situation in general.*

2. THE Muſcles in general are bundles of Fibres of different figures and ſizes, and for the moſt part conſiſting of two different portions; one whereof is thick, ſoft, more or leſs red, and ſometimes pale, forming what is called the body, fleſhy ſubſtance or belly of the Muſcle. The other is thin and ſmall, of a cloſe contexture and very white, forming the Extremities and other parts termed by Anatomiſts Tendons or Aponeuroſes. The fleſhy Portion is the principal and eſſential part of the Muſcle, being never wanting; but the Tendinous or Aponeurotic Portion is in ſome Muſcles ſo very ſmall as to be inviſible. Both Portions are covered by a particular Membrane. *External Conformation.*

3. THE Ancients who compared a Muſcle to a Rat or other Animal flead, divided it into the Head, Belly and Tail; but the Moderns finding this compariſon very lame and faulty, have left off the uſe of all the terms ariſing therefrom except that of Belly; and inſtead of the other two, they uſe thoſe of Beginning or Origin, and Inſertion. Some of the lateſt Authors think it moſt proper to call one end of the Muſcle, the fixed Point or Fulcrum, the other the moveable Point. *Diviſion.*

4. ALL theſe terms, whether old or new, tend to miſlead us, and that of Fulcrum is without foundation. The beſt and moſt ſimple diviſion of a Muſcle is into the Body or fleſhy Portion, which in ſome Muſcles may be termed the Belly, and the Extremities, whether Tendinous, Aponeurotic, or fleſhy.

5. THE Fibres, of which a Muſcle is made up, go by the general name of moving Fibres, and each of them, as well as the whole Muſcle, is partly tendinous and partly fleſhy. They are for the moſt part ranked in faſciculi, in a lateral ſituation with reſpect to each other, and diſtinguiſhed by *Internal Structure.*

by Membranous, Cellular or Adipoſe Septa, as by ſo many particular Vaginæ.

6. These Fibres are connected to each other, and to the intermediate Septa by a great number of very ſmall fine Filaments, the Capillary Extremities of Arteries, Veins and Nerves running over them, and they are incloſed in a thin, membranous, cellular covering, called the proper Membrane of the Muſcle, being a continuation of the Septa or Vaginæ already mentioned.

7. All theſe Septa or Vaginæ communicate with each other, by a mutual and reciprocal continuation of their cellulous Texture, and they are bound down tranſverſely by filamentous or fibrous Pellicles, which croſs them at ſmall diſtances from one another, and lie nearly in the ſame direction through the whole body of the Muſcle. The ſame ſort of Fræna are obſervable between the moving Fibres, which connect them together, and appear to be in ſome meaſure nervous.

8. The particular Structure of each moving Fibre is not as yet ſufficiently known. They may all be divided into ſeveral ſmaller Fibrillæ; and the ſubſtance of their fleſhy Portion is believed by ſome to be cellulous, by ſome to be veſicular, and by others to be ſpungy or medullary. Some of the Ancients imagined this Portion to be hollow, and that it contained a ſort of Pulp called by them *Tomentum*, more or leſs ſaturated with Blood.

9. When we examine a Moving Fibre through the beſt Microſcopes, both the fleſhy and Tendinous parts of it appear contorted, but the latter not ſo much as the former. Having injected any coloured penetrating liquor, we may by the help of an ordinary Microſcope diſcover a very fine and cloſe Vaſcular Net-work which inſinuates itſelf between all the Fibres, covering or being twiſted round them, and likewiſe ſpread on the Septa.

10. The fleſhy Portion may be contracted or ſhortened, and relaxed or elongated. The Tendinous Portion yields but very little, reſiſting any force tending to prolong it, except it be ſo violent as to diſorder it's texture.

11. The diſpoſition of the Moving Fibres is different in different Muſcles, and their Tendinous and fleſhy Portions do not always lie in the ſame ſtrait Line, but makes oppoſite Angles with each other. In ſome Muſcles the fleſhy Portion is not all of the ſame length, in others it is nearly equal, but the Fibres unequally and gradually diſpoſed at the ſides of each other, forming all together an oblique Plane.

12. Some are diſpoſed like Radii, others form Planes more or leſs incurvated; and ſome form complete Circumferences, the two Extremities meeting and uniting together.

13. The tendinous Portions being only the ſupplement of the whole length of the Muſcle, may be of equal or unequal lengths, according to the diſpoſition of their inſertions. They may be very ſhort at one end of the Muſcle and very long at the other. When the fleſhy Plane is partly oblique, they vary gradually in length, and when that obliquity is reci-

procal at both ends, in form of a Lozenge, the Tendinous Portions are alternately long and ſhort.

14. In ſome Muſcles each moving Fibre is nearly of the ſame length with the body or belly of the Muſcle; in others the fleſhy Fibres are very ſhort, though the body of the Muſcle formed by them be very long. In the firſt kind, the Fibres run more or leſs ſtrait from one end to the other, and are never very numerous. In the ſecond they are ſituated obliquely, and are conſequently in great numbers; ſo that the length of each Fibre is not always to be meaſured by that of the body of the Muſcle to which it belongs.

15. These different Portions of Fibres are not equally to be met with in all Muſcles. Some have two or more Tendons, ſome only one, but of different lengths; others have none at all, or at leaſt none that can be perceived, as has been already ſaid.

16. But there is no Muſcle without a fleſhy Portion which alone being capable of contraction, is abſolutely neceſſary; whereas the Tendons in many places are only productions, by which the Muſcles are fixed to parts at a diſtance from them.

17. Many Muſcles are obſerved to be covered by an Aponeurotic Expanſion of different degrees of ſtrength and ſize, which ſeems to ariſe from one or more of the neighbouring Tendons. In proportion as it is extended it grows thinner, and then loſes itſelf in the Cellular Membrane, called formerly the common Membrane of the Muſcles.

18. There are likewiſe ſtrong ligamentary Membranes of another kind, by which many Muſcles are covered as by a Girth, and which may be termed broad or ligamentary Bands or Coverings. They are made up of ſeveral Planes of ſtrong white ſhining Fibres, croſſing each other, and they are ſtrongly fixed along one or more Bones, almoſt in the ſame manner as the interoſſeous Ligaments of the Fore-Arm and Leg. They furniſh Septa or common Vaginæ to the Muſcles which they cover, and likewiſe particular Vaginæ to the Tendons, thinner than thoſe of the fleſhy Portions.

19. These common Bands and Vaginæ ſerve to gird and confine the Muſcles, and to keep them in their places in great efforts. They likewiſe in ſome meaſure ſupply the place of Tendons, and multiply the Inſertions. The looſe portions of theſe Membranes are lined on the inſide with other very fine Membranes, which are continually moiſtened by a mucilaginous liquor to preſerve the Muſcles and Tendons contiguous to them, from friction.

20. Besides theſe Bands and Septa there are other ligamentary Fræna peculiar to the long Tendons, called by the name of Annular Ligaments, the general hiſtory of which is to be found in the deſcription of the freſh Bones.

*Difference and Names.*

21. The difference of Muſcles is very conſiderable, and depends on many circumſtances, the chief of which are the Size, Figure, Direction, Situation, Structure, Connexion and Uſe; and it is from theſe differences that the names

of the greateſt part of the Muſcles are taken. From their Size they are termed Great, Middle, Small, Long, Broad, Thin: From their Figure, Triangular, Scalenous, Square, Rhomboïdal, Indented, Orbicular, Deltoide: From their Direction, Strait, Oblique, Tranſverſe: From their Situation, Superior, Inferior, External, Internal, Anterior, Poſterior, Right and Left: Theſe four differences and the names derived from them are eaſily comprehended; but what relates to the other three, acquires a little farther explication.

22. WITH reſpect to their Structure, Muſcles are either ſimple or compound. Simple Muſcles are thoſe whoſe fleſhy Fibres, or rather the fleſhy Portions of their moving Fibres are all uniformly diſpoſed, and terminate in Tendons lying either in a ſtrait or oblique Line in the manner already explained.

23. COMPOUND Muſcles are thoſe whoſe fleſhy Fibres are diſpoſed obliquely in ſeveral particular ranks, repreſenting the ſame number of ſimple Muſcles with their Fibres lying in oppoſite directions. In proportion to the number of theſe ranks or ſeries, the Muſcle is ſaid to be more or leſs compounded.

24. WHEN the compound Muſcle is made up of two ſimple Muſcles only, theſe are ſo diſpoſed as to repreſent a Feather, and the compound Muſcle is from thence termed Penniform. In ſome of theſe Muſcles one of the Tendons appears to be ſlit or divided, in order to contain the fleſhy Portion between it's two parts, while the other runs through the body of the Muſcle diminiſhing gradually in ſize as it advances in the ſame manner as we ſee in a Feather. In others there is only one middle Tendon between the ſeries of fleſhy Fibres which are by their other Extremity fixed to other parts. In more compound Muſcles, the Tendons at one Extremity may all unite together, while thoſe at the other remain divided.

25. BUT there are ſtill other kinds of compound Muſcles. Some are made up of two placed endwiſe and joined together by a common Tendon, ſo that this Tendon, the two Muſcles and the two Tendons at their Extremities, lie all in a Line, and form the whole length or extent of the compound Muſcle, which is termed Digaſtricus, or Biventris; and if three Muſcles be thus joined, the compound is called Trigaſtricus.

26. SOME are made up of two Muſcles more or leſs in a lateral ſituation with reſpect to each other, and united at one Extremity; others are made up of three or four Muſcles ſituated in the ſame manner; and if they are united at that Extremity, which the Ancients called the Head of the Muſcle, they are called Bicipites, Tricipites, *&c.* according to the number of theſe Heads; but if they are joined at the other Extremity, they are termed Bicornes, Tricornes, *&c.*

*Connexion.* 27. THE Muſcles are fixed by their Extremities to different parts, and in different places of the human Body. The greateſt part of them are inſerted in Bones alone. Some are fixed partly to Bones and partly to Cartilages, as thoſe of the Ear and Noſe; ſome partly to Bones and partly to the Integuments, as ſeveral Muſcles of the Face, which may therefore be termed Semicutaneous, in imitation of thoſe in Brutes, which being inſerted in the Integuments alone, are from thence termed Cutaneous. In ſome the Fibres make an entire circle, without terminating any where by their Extremities; of this kind are ſeveral of thoſe called Sphincters, to which may be added the Heart, Stomach and Inteſtines. All the Muſcles have likewiſe a ſort of connexion with the neighbouring parts, but this is only lateral by means of Membranes.

28. The Names taken from the Connexions and Inſertions of Muſcles *Names.* are generally of two kinds; one common and referred to ſome conſiderable part of the Body, as when we ſay the Muſcles of the Head, of the Thorax, Abdomen, Arm, Leg, Eye, Lips, *&c.* the other proper, ſpecifying more particularly the Inſertions of each Muſcle, as the Maſtoideus, Sterno-Maſtoideus, Coraco-Brachialis, Anconeus, Peroneus, *&c.* Some Names have no relation to the Inſertions, as thoſe of Ulnaris and Radialis, which are given to Muſcles which lie upon the Ulna and Radius, without being inſerted in either Bone.

29. The Names of the firſt kind relate more to the uſes of Muſcles than to their Inſertions, and are for the moſt part ill founded and apt to miſlead us, as will appear when we come to the uſes of the Muſcles. The Names of the ſecond kind are inſtructive, and thoſe of the third are tolerable.

30. The general Uſe of the Muſcles is to move all the parts of the *Uſes.* Body, whether hard, ſoft or fluid. Moſt of the hard and ſoft parts are moved by theſe Powers being fixed to them, and they move the reſt without any ſuch Inſertion.

31. The Muſcles fixed by both Extremities to hard parts reciprocally moveable, may accordingly move either part. Thus the Muſcles inſerted by one Extremity to the Os Humeri, and by the other to the Ulna, may move the Ulna upon the Os Humeri, and the Os Humeri, upon the Ulna.

32. Muscles fixed by one Extremity to hard parts, and by the other to ſoft parts, cannot perform theſe reciprocal motions, becauſe in this caſe the hard parts muſt remain immoveable, the ſoft parts only being moved, as in the Muſcles of the Ball of the Eye, thoſe of the Lips, *&c.*

33. The Fluids, of whatever nature or conſiſtence they be, are moved in ſome caſes by being immediately puſhed or projected by the Muſcles, as we ſee in the Heart, in others by their Canals being preſſed upon, as in the oblique and tranſverſe Muſcles of the Abdomen; and there are other Muſcles which ſtop or retard the motion of the Fluids at one time, and facilitate or accelerate it at another, as all the Sphincters.

34. The Uſe of each Muſcle in particular confined to the motion of one or more moveable parts; ſome parts require a certain number of Muſcles to move them, whereof ſome act one way and ſome another. Several Muſcles, for inſtance, move the Os Humeri upon the Scapula, and of theſe ſome raiſe, others depreſs it; ſome turn it forward, ſome backward, and others round upon it's axis, *&c.* In like manner the Fore-Arm is moved

upon the Os Humeri by certain Muſcles, whereof ſome extend and others bend it.

*Enumeration and Diſtribution.*

35. The general Enumeration of the Muſcles of the human Body which is commonly made, is founded on their ſuppoſed particular uſes. We meet with liſts of the Muſcles of the Head, of the Thorax, Abdomen, Extremities, Eye, Noſe, Lips, &c. and to the different Muſcles ſaid to belong to each part, names are given, ſpecifying ſome determinate uſe; ſuch as Raiſers, Depreſſors, Adductors, Abductors, Flexors, Extenſors, *&c.*

36. This method of diſtributing and naming Muſcles is very well ſuited to the memory, and may be retained for thoſe that are not entirely, or are not at all fixed to Bones; but with reſpect to thoſe Muſcles which are inſerted in Bones alone, this way of talking is very capable of miſleading Beginners, of begetting falſe Ideas, of obſtructing the progreſs of Knowledge, and even of making able Philoſophers, Phyſicians and Surgeons fall into conſiderable miſtakes.

37. It leads us naturally into ſeveral Errors, as for inſtance; that the parts to which a certain number of Muſcles is attributed, cannot be moved by other Muſcles; that the Muſcles ſaid to belong to one part can move no other part; that the Muſcles whoſe uſes are limited and determined by certain names, can have no other uſes; and that the Muſcles ſo named may have the uſes aſſigned to them in all the different ſituations of the parts to which they are fixed. It is however abſolutely neceſſary for the ſake of memory, to divide the Muſcles into Claſſes, and afterwards to ſubdivide each of theſe Claſſes.

38. To ſhun the inconveniences already mentioned in the Muſcles fixed only to Bones, I diſcard the names taken from the parts to which theſe Muſcles are commonly attributed, and from the uſes aſſigned to them: I retain as much as is poſſible the uſual names which expreſs only the Inſertions or other circumſtances, that I may avoid all affectation of novelty; and when I find my ſelf obliged to change a name, I ſet down the common name, after that which has appeared to me to be more natural and agreeable.

39. Thus, for inſtance, inſtead of this title: The Muſcles of the Arm, I put the following: The Muſcles that move the Os Humeri upon the Scapula, and the Scapula upon the Os Humeri; and having deſcribed thoſe which are commonly mentioned, I add the reſt which may likewiſe move the part; and point out the uſes which the Muſcles deſcribed may have, in moving other parts.

40. On this plan it will be neceſſary to deſcribe ſeparately all the Muſcles which are wholly inſerted in Bones, and not to explain their uſes till they have all been deſcribed, they being ſo nearly related to one another, that it is very difficult to ſpeak of the uſes of any one, without mentioning ſeveral others.

41. When ſeveral concur nearly in the ſame motions, they are termed Congeneres; thoſe which act in oppoſite directions are relatively and al-

ternately called Antagoniſts. Thus all the Muſcles which extend or bend the Fore-Arm are Congeneres; and thoſe which extend it are Antagoniſts to the Flexors; and theſe again reciprocally Antagoniſts to the Extenſors.

42. THERE muſt at leaſt be two Muſcles to intitle them to the name of Congeneres, but that of Antagoniſt may be given to one Muſcle as well as to ſeveral. Many Muſcles contribute to the ſame motion without being Congeneres, *viz.* where by acting in an oblique direction, they produce a third motion which is direct and determinate. This is termed a combined Motion, and may be ſucceſſively continued in different directions, as that of the Arm in turning a ſling or the handle of any heavy Machine. Laſtly, When all the Antagoniſts on every ſide, or all the Muſcles that move a part, act equally and keep the part fixed in a middle direction between all the motions of which it is capable, they are ſaid to be in a Tonic Motion.

43. To move any part, or to keep it in a determinate ſituation, all the Muſcles belonging to it muſt co-operate, ſome of them drawing the part directly to the ſituation or attitude deſigned, ſome moderating this firſt motion by acting in a contrary direction, and others directing it laterally. The firſt kind of theſe Muſcles I call principal Movers, the ſecond Moderators, and the third Directors.

44. ALL theſe kinds are to be found in the Articulations by Enarthroſis, and in many of thoſe by Arthrodia. The Director Muſcles are wanting in thoſe by Ginglymus, being there unneceſſary. The Moderators in general are the ſame with thoſe termed Antagoniſts, and the want of their action is in many caſes ſupplied by the weight of the part to which they are fixed, or by the additional weight or reſiſtance of ſome other Body.

*Muſcular Action.*

45. THE Action of the Muſcles in general, or, to ſpeak more properly, the Mechaniſm of this Action conſiſts chiefly in the contraction or ſhortening of their fleſhy Portion; by which the Extremities of the Muſcles are brought nearer to each other, and conſequently the parts are moved to which theſe Extremities are fixed. It is, I ſay, the fleſhy Portion alone which is ſhortened; the Tendons retain always the ſame length, and only follow the motions of the other part, much in the ſame manner as in drawing a great weight by ropes fixed to it, where the Arm alone is ſhortened, while the ropes only follow that motion.

46. THE principal Phænomena of Muſcular Action are theſe: The fleſhy Portion appears harder and more ſwelled in the time of action than of inaction, as may be readily perceived by touching it in both ſtates: The hardneſs of this ſwelling increaſes in proportion as the motion is continued, as is likewiſe evident by the touch; and it likewiſe increaſes by merely adding to the weight or reſiſtance of the part moved, though it's ſituation does not continue to be changed.

47. IN many Muſcles, this action may be determined to any degree of velocity and ſpace; that is, may be proportioned to the velocity and ſpace of the motion; may be increaſed and diminiſhed, accelerated, re-

tarded or ſtopped; and may be made to ceaſe in an inſtant, and be produced again in another inſtant.

48. During the contraction of a Muſcle, it's Fibres are bent through their whole length, or formed into very ſmall fine folds in alternately oppoſite directions, as may be plainly ſeen in Animals freſh killed, when the Butchers cut their fleſh while it remains warm, though the blood has been let out, and the entrails removed. By opening living Animals, and alſo in great wounds, the fleſhy Fibres have been diſcovered to grow pale during their Action, and to turn red again when at reſt.

49. To theſe Phænomena we muſt likewiſe add, that where ſeveral Muſcles are fixed to any moveable part, they are all in a ſtate of contraction, in every motion of that part; but they are not all in the ſame degree of action, becauſe the principal Movers act more than the Moderators and Directors, or collateral Muſcles, if any belong to the part. This co-operation of Muſcles is eaſily perceived by touching them when the part they belong to is moved with a conſiderable force. It muſt however be remembered, that I except the Moderators or Antagoniſts when any weight or aſſiſtance ſupplies their action.

50. Lastly, there are ſome motions to which the Muſcles, commonly believed to produce them, contribute nothing at all, but which depend ſolely on the relaxation of the Antagoniſts to theſe Muſcles, or thoſe that lie on the oppoſite ſide. This is ſeen evidently in ſupporting the Body by one Hand reſting on a low Table, the Joint of the Elbow being in that ſtate ſuffered to yield to the weight of the Body, or to bend ſometimes ſlowly and ſometimes faſt; for if at the ſame time we feel with the other Hand the Flexor and Extenſor Muſcles of the Fore-Arm, the firſt will be found perfectly relaxed, the latter very much contracted. Thus it is evident that ſome Muſcles may be relaxed to determinate degrees of velocity and ſpace, with the ſame certainty as they can be contracted.

51. This laſt Phænomenon gave me room to conclude, that the action of the Muſcles in general conſiſts really in the relaxation of the moving Fibres when contracted, as in the contraction of them when relaxed, whether this action be performed ſucceſſively or inſtantaneouſly; and it was for this reaſon that when I began to ſpeak of the action of the Muſcles, I did not ſay abſolutely that it conſiſted in the contraction of the fleſhy Portion, but only that it was principally owing thereto. I do not here ſpeak of thoſe Motions that are out of our power, and which we can determine only in part as thoſe of Reſpiration, or not at all, as that of the Heart.

52. The particular Mechaniſm or immediate Cauſe of muſcular action has very much tortured the Brains of many Philoſophers. The extreme delicacy of the Texture of a moving Fibre, and a great number of Phænomena, ſome of them very obvious, which have not been attended to, have hitherto prevented the diſcovery of this Myſtery. Several Hypotheſes have been formed concerning the Structure of this Fibre, which, as already ſaid, has been ſuppoſed ſpungy, vaſcular, veſicular, contorted, elaſtic, &c.

and concerning the concurrence of different Fluids with the ſuppoſed Structure of the Fibre; and Syſtems have even been founded wholly on the Spring or Elaſticity of the ſolid Parts of which a Muſcle is compoſed.

53. But by conſidering attentively the Phænomena already mentioned, eſpecially the firſt three concerning the velocity, ſpace and duration of Muſcular action, all theſe Syſtems may be deſtroyed. For hitherto no inſtance can be found either in natural effects or in thoſe of art, of any Exploſion, Fermentation, Ebullition, Injection, Inflation, Imbibition, Vibration, Elaſticity, *&c.* by which we can regulate and determine to a given degree, the Space, Velocity and Duration of any artificial Motion, or by which we can begin and put an end to ſuch Motions in an inſtant of time at our pleaſure. It is therefore altogether to no purpoſe to amuſe our ſelves with what has been ſaid on this Subject: Another method muſt be followed, which conſiſts in collecting and examining all the Phænomena that can fall under our obſervation.

54. Till ſome ſuch lucky diſcovery is made, what can hitherto with the greateſt certainty be gathered from the Structure, Conformation and Action of the Muſcles is, that their ſtrength depends on the number of their fleſhy Fibres, and the extent of their Action on the length of theſe Fibres.

55. For wherever ſtrength is more neceſſary than large degrees of motion, there we find the Fibres of Muſcles proportionably increaſed in number, and that their ſituation in a narrow compaſs is artfully provided for by the oblique diſpoſition of them already mentioned. In like manner, wherever there is more occaſion for a large degree of Motion than for ſtrength, the fleſhy Fibres are of a proportionable length. In a word, the ſtrength of a Muſcle is as the number of it's fleſhy Fibres, and the extent of it's motion as the length of theſe Fibres.

56. To underſtand the uſes and contrivance of each Muſcle in particular, we muſt conſider attentively it's place or ſituation in general, it's external Conformation, Inſertions, particular Situation, Direction, Lateral Connexion, Relation and Compoſition of it's parts. We ought likewiſe to examine how the neighbouring Muſcles are diſpoſed for producing ſimple Motions, and how thoſe that are at a greater diſtance can produce combined or compound Motions.

57. It ought moreover to be obſerved that in ſome ſubjects the Muſcles vary, ſome being wanting, and others added in different manners, ſo that we ought to regulate our ſelves by what happens moſt frequently and univerſally, that we may not render the common caſes obſcure for the ſake of a few that are extraordinary, and which ought to be conſidered in the ſame light as we do the inſtances of ſix Fingers, eleven Ribs, and other varieties of the like kind.

58. Muscles fixed only to Bones act as ſo many Powers applied to Levers. By a Lever we underſtand a long inflexible Body, like a Rod or Bar, by the help of which we raiſe Weights and overcome Reſiſtances,

which it would be more difficult or impoſſible to do with the Hands alone.

59. A Lever, in order to act, is applied to three different things at three different places of it's length, *viz.* at one place to the Weight or reſiſting Body, at a ſecond to the Power by which it acts, and at a third to a Fulcrum, which with reſpect to the other two, ought to be immoveable; ſo that the whole length of the Lever is as it were divided by three Points, which may be termed the Fixed Point, Point of Reſiſtance and Point of Power.

60. These three Points may be diſpoſed in three different manners. 1. The fixed Point may lie between the Power and the Weight; as when the Stone-cutters and Pavers raiſe or move ſtones with iron Crows. 2. The Weight may lie between the Power and the Fulcrum, as when Maſons move large ſtones by applying Crows to them ſomewhere near their middle. 3. The Power may lie between the Weight and Fulcrum, as when Braziers ſcrape Copper in order to tin it, by laying one end of the Scraper on the Shoulder, the other on the Metal, and holding the middle in their Hands.

61. From theſe three Diſpoſitions three different kinds of Levers have been eſtabliſhed. In the firſt the Fulcrum or fixed Point is in the middle; in the ſecond the Weight, and in the third the Power.

62. In the action of Levers the following Maxims are to be obſerved as ſo many general Rules.

63. The greater the diſtance of the line of Direction of the Power from the Fulcrum, leſs force is neceſſary to overcome the Reſiſtance.

64. The nearer that this line of Direction is to the Fulcrum, more force is neceſſary to overcome the Reſiſtance or to raiſe the Weight.

65. When the line of Direction of the Power paſſes through the fixed Point, and conſequently falls in with the Direction of the Lever, the Power can produce no effect.

## ART. II.

### *The Muſcles of the Abdomen.*

*Number and Situation in general.*

66. BY the Muſcles of the Abdomen or Lower Belly we mean thoſe which form principally the Sides or Circumference of that Cavity. They are commonly ten in number, five on each ſide; eight whereof are very large, the other two very ſmall.

*Diviſion, Figure.*

67. Of theſe Muſcles two are long, called Muſculi Recti, two ſmall called Pyramidales; ſix broad, two of which are named Obliqui Externi two Obliqui Interni, and two Tranſverſales. The Pyramidales are wanting in ſome ſubjects, ſometimes there is but one, and ſometimes three.

The name of theſe two Muſcles has been taken from their Figure, thoſe of the other eight, from the principal direction of their Fibres.

68. These ten Muſcles lie in pairs, and thoſe of each ſide appear to be ſeparated by a kind of Tendinous Line or Band running along the Anterior part of the Abdomen, from the Cartilago Enſiformis to the Symphyſis of the Oſſa Pubis, and including the Umbilicus; above which it is pretty broad, but narrower below, eſpecially near the Oſſa Pubis.

69. This Tendinous Band is named Linea Alba, and, as we ſhall ſee afterwards, is wholly formed by the intertexture of the Tendons of ſix broad Muſcles. *Linea Alba.*

70. I ſhall here deſcribe only the five Muſcles of one ſide, the other five being exactly like theſe; and the ſame method will be obſerved through the whole of this Treatiſe.

## §. 1. *Obliquus Externus.*

71. The Obliquus Externus is a broad thin Muſcle, fleſhy on it's upper and back part, and Tendinous on the Anterior and greateſt Portion of the lower part. It reaches from half the Lateral and Inferior part of the Thorax, to almoſt half the Lateral and Superior part of the Pelvis; and from the back part of the Regio Lumbaris to the Linea Alba. *Figure and Situation in general.*

72. It is fixed by it's upper part, to the Ribs, by the lower, to the Os Ilium, Ligamentum Falloppii, and Os Pubis, and by the fore part to the Linea Alba. The Poſterior Portion next the Vertebræ of the Loins has commonly no true muſcular Inſertions. *Inſertions.*

73. In the firſt place it is fixed to eight Ribs (ſeldom to nine) that is, from the fifth true Rib to the laſt of the falſe, by the ſame number of Angles of it's fleſhy Portion in the following manner. It adheres to the external Labia of the lower Edges of the two or three laſt true Ribs, and of the four following falſe Ribs, at their bony Extremities; to the Extremity of the Cartilage of the laſt falſe Rib; to the external Labium of the lower Edge of that Rib, and a little to the broad Ligament which connects it to the Tranſverſe Apophyſes of the firſt Vertebræ of the Loins.

74. The Inſertions in the bony Extremities of the Ribs are at different diſtances from the Cartilages in this order: In the ſeventh true Rib the Inſertion is very near the Cartilage, in the ſixth at a little more diſtance; in the fifth the diſtance is about an inch; in the firſt falſe Rib, two inches; in the ſecond, and third, three Inches; in the fourth, about two inches, and ſometimes leſs; in the fifth, the Inſertion reaches, and in a manner ſurrounds the Cartilage.

75. The name of Digitations or Indentations has been given to theſe Angular Inſertions, becauſe they join a like number of the ſame kind belonging to other Muſcles, as the Fingers of the two Hands are locked between each other. Three or four of theſe Digitations belong to the Serratus Major; and the ſame number to the Latiſſimus Dorſi. The three

or four loweſt Digitations join likewiſe thoſe of the Serratus Poſtericus Inferior, which are covered by the Extremities of the Latiſſimus Dorſi.

76. Though theſe Digitations appear to be wholly fleſhy, they are almoſt all a little Tendinous towards the back part. They ſeem to increaſe in breadth as they deſcend, and often unite more or leſs with the Intercoſtal Muſcles in their paſſage over them. Sometimes they communicate likewiſe with the Pectoral Muſcle, the Serratus Major and Latiſſimus Dorſi, by diſtinct Faſciculi of fleſhy Fibres, which are true reciprocal continuations of theſe Muſcles.

77. There are likewiſe other internal Inſertions covered and hid by thoſe which appear outwardly, and which belong to the Ribs lying immediately below thoſe to which the outward Digitations are fixed. Thus the Digitation fixed in the laſt true Rib, ſends off a Faſciculus to the firſt falſe Rib, as it runs up on the foreſide thereof.

78. The firſt Digitation, or that belonging to the fifth true Rib, appears longer than the reſt, and is about the breadth of two Fingers, having communicating Fibres with the Pectoralis Major. The ſecond, or that of the ſixth true Rib, is about an inch in breadth, and unites a little with one Digitation of the Serratus Major. The third, or that of the ſeventh true Rib, is about three Fingers in breadth, and runs for a ſmall ſpace toward the Cartilage on the outſide of the Rib. The fourth, or that of the firſt falſe Rib, mixes by ſome of it's anterior Fibres with thoſe of the Serratus Major. The fifth, or that of the ſecond falſe Rib, mixes both with the foregoing and with the firſt Digitation of the Latiſſimus Dorſi, and runs for ſome ſpace on the ſurface of the Rib. The ſixth, or that of the third falſe Rib, is about two Fingers in breadth, and ſends off a Faſciculus of Fibres to the Serratus Major. The ſeventh is of the ſame breadth with the former, and ſome of it's Fibres are continued to the Serratus Poſtericus Inferior. The eighth, or that belonging to the loweſt falſe Rib, has been already deſcribed.

79. From theſe Inſertions in the Ribs, the Fibres of this Muſcle run down obliquely from behind forward. Thoſe which come from the three loweſt Ribs are leſs oblique than the reſt, appearing to form a diſtinct Portion which continues fleſhy all the way to the external Labium of the Criſta Oſſis Ilium, in which it is inſerted from the poſterior part of the Tuberoſity of that Criſta, to the anterior and ſuperior Spine. This Inſertion is by very ſhort tendinous Fibres through one half the Criſta; through the other half they are longer, and ſome of them communicate with the Faſcia Lata of the Thigh. The poſterior part of this Portion ſeems to me to conſiſt of a double Plane.

80. The other Portion of this Muſcle, though not altogether ſeparated from the former, runs more obliquely; and after ſome ſpace, it's fleſhy Fibres degenerate into a ſtrong broad Aponeuroſis or thin Tendon; the Extremities of the fleſhy Fibres from the fifth true Rib to the anterior Spine of the Os Ilium, forming a line, which till it reaches as low as the Umbilicus, is ſtrait, and from thence downward, is incurvated backward.

ward. One Portion of the Tendinous Plane runs down to the Anterior and Superior Spine of the Os Ilium, where it unites a little with the Superior Tendon of the Muſculus Sartorius, and afterwards is continued to the Spine of the Os Pubis, being by it's lower Edge firmly united to the Ligamentum Falloppii, and adhering cloſely to the Faſcia Lata.

81. This Aponeuroſis grows firmer and thicker in it's progreſs toward the Os Pubis, and in old Age becomes hard and dry; for which reaſon Hernia's are moſt troubleſome in old People. A little before it reaches the Os Pubis it is divided into two Portions, one Superior or Anterior, the other Inferior or Poſterior, between which a Fiſſure or opening is left of a particular kind.

82. The Superior or Anterior Portion runs obliquely downward toward the Spine of the Os Pubis, croſſes over the foreſide of the Symphyſis, and is inſerted in the lower broad part of the Os Pubis on the other ſide. As it paſſes the Symphyſis, it croſſes the like Portion of the other External Oblique, and their Fibres decuſſate each other.

83. The Inferior or Poſterior Portion running more downward, ends in the middle part of the Symphyſis, ſome ſmall part of it being continued to the Os Pubis on the other ſide.

84. Near their Extremities theſe two Portions approach, ſo that the opening formed by them is in ſome meaſure oval, but narrower below than above. Through this Opening the Spermatick Veſſels paſs in Men and the Round Ligaments in Women, but in them the Opening is much lower than in Males. It is about two Fingers breadth in length, and about half a Finger in breadth at it's upper part, and there it is ſtrengthened by ſeveral Tendinous Fibres detached obliquely from each ſide, which form a ſort of roundiſh Border, from whence theſe Openings got the name of Rings. Theſe Collateral Fibres hardly appear in Children.

85. The Inferior or Poſterior Portion ſends off a particular Expanſion to the Faſcia Lata, which having formed a covering for the Inguinal Glands, is afterwards loſt in the Fat.

86. The remaining part of the Tendon of the External Oblique is fixed by oblique Fibres in the Linea Alba through it's whole length, mixing with thoſe that come from the ſame Muſcle on the other ſide. Theſe Tendinous Fibres are likewiſe continued a great way beyond the Linea Alba through the Tendon of the other Muſcle, and this Intertexture is reciprocal. Thoſe who look upon the fleſhy part of this Muſcle at it's beginning, call it Obliquus Deſcendens, and it has likewiſe been named Obliquus Superior and Obliquus Major.

### §. 2. *Obliquus Internus.*

*Figure and Situation in general.*

87. The Internal Oblique is a broad thin Muſcle like the former, having nearly the ſame extent and inſertions, that is, in the lower Ribs above; in the Criſta of the Os Ilium, and Ligamentum Falloppii, below; and in

the Linea Alba, before; but it differs from it in this, that it's lower part is more fleſhy than the upper.

*Inſertions.* 88. One Portion of it's lower Extremity, which is entirly fleſhy, is fixed by very ſhort Tendinous Fibres in the middle ſpace between the two Labia of the Criſta Oſſis Ilium, from the back part of the Tuberoſity of that Criſta near the Symphyſis of the Os Sacrum, almoſt all the way to the Superior and Anterior Spine of the Os Ilium; ſo that it's Inſertion reaches further back than that of the External Oblique.

89. The fleſhy Fibres thus fixed, run up firſt a little obliquely from behind forward, and then this obliquity increaſes proportionably as the Fibres lie more anteriorly, and they croſs thoſe of the fleſhy Portion of the External Oblique, being afterwards inſerted exteriorly in the lower Edges of the Cartilages of all the falſe Ribs, and thoſe of the two loweſt true Ribs, reaching to the Extremity of the Cartilago Enſiformis.

90. These Inſertions form fleſhy Digitations at the Extremity of the loweſt falſe Rib, at the bony Extremity of the fourth, and through all it's Cartilage, and at the middle Portion of the Cartilage of the third. Here the Inſertions become Tendinous, and an Aponeuroſis is formed, which from the ſecond falſe Rib anteriorly, is divided into two Laminæ by which the Muſculus Rectus is incloſed.

91. The other Portion of the lower Extremity of this Muſcle, continuous with the former, is fixed to the Anterior Extremity of the Criſta of the Os Ilium, to its Anterior and Superior Spine, and to that part of the Ligamentum Falloppii which lies neareſt it. From all this Inſertion, the Fibres expand like Radii through the whole extent of the Linea Alba. Thoſe from the Criſta run toward the upper part of the Linea Alba, and afterwards they gradually change their Direction, till at length they become almoſt perpendicular to that Line. Thoſe that come from the Spine and Ligamentum Falloppii, are gradually bent downward, and are inſerted partly in the Spine, partly in the Symphyſis of the Os Pubis, being inſeparably mixed with the lower Edge of the Aponeuroſis of the External Oblique.

92. This Anterior or Radiated Portion being at it's Beginning wholly fleſhy, becomes afterwards wholly Tendinous, and together with the Tendon of the other Portion, forms an Aponeuroſis like that of the External Oblique, the Extremities of all the fleſhy Fibres forming an oblique Line a little bent from above downward, beginning at the third falſe Rib, and reaching to the Ligamentum Falloppii.

93. The Aponeuroſis of the Internal Oblique thus formed, is afterwards divided into two Laminæ, from the Extremity of the ſecond falſe Rib, to it's lower Edge; and having by this diviſion furniſhed a Vagina to the Muſculus Rectus and Pyramidalis of the ſame ſide, the two Laminæ unite again at the Linea Alba, being interwoven with thoſe belonging to the Muſcle on the other ſide, and mixed with the Aponeuroſis of the External Oblique in a very ſingular manner. This Aponeuroſis is every where cloſely joined to that of the External Oblique, and the Vagina of the

Rectus ſeems to be ſtronger above the Umbilicus than below it, and near the lower Extremity of the Linea Alba becomes ſo thin, that the Rectus and Pyramidalis may be ſeen through it.

94. In the Paſſage between the Anterior and Superior Spine of the Os Ilium, and Os Pubis, at ſome diſtance above and behind the Tendinous Opening or Ring of the External Oblique; the fleſhy Fibres at the lower Edge of the Internal Oblique, leave a paſſage for the Spermatick Veſſels in Men, and for the Vaſcular Rope called the Round Ligaments in Women. This paſſage is near the place where this Muſcle joins the Aponeuroſis of the former; and though it appears in ſome ſubjects to be formed by a real ſeparation of ſome fleſhy Fibres, in others it lies between the fleſhy Edge of this Muſcle and the Inſertion of the Obliquus Externus in the Ligamentum Falloppii. In this courſe a Faſciculus of fleſhy Fibres is likewiſe detached from this Muſcle, which contributes to the Formation of a ſmall Muſcle called Cremaſter, as we ſhall afterwards ſee.

95. There is moreover a thin Plane or Series of fleſhy Fibres, between the back part of this Muſcle and the Aponeuroſis of the Muſculous Tranſverſalis, which covers the Quadratus Lumborum, and ſeems to be fixed by a broad Aponeuroſis to the Ligament which goes between the laſt Vertebra of the Loins and the Tubercle of the Criſta Oſſis Ilium. From thence it runs obliquely upward and forward, and contracting in breadth is fixed in the Extremity of the laſt falſe Rib. Therefore if this Series be reckoned a part of the Internal Oblique, this Muſcle muſt be ſaid to be inſerted not only in the Criſta of the Os Ilium, but alſo in the laſt Vertebra of the Loins, by means of the Ligament already mentioned.

96. This Muſcle is likewiſe called Obliquus Deſcendens, for the ſame reaſon that the former is termed Aſcendens; Obliquus Inferior and Obliquus Minor, becauſe it does not reach ſo high, and is not quite ſo large as the External Oblique.

### §. 3. *Muſculi Recti.*

97. The Recti are long narrow Muſcles, thicker than the Obliqui. They lie near each other like two large Bands, from the lower part of the Thorax to the Os Pubis, the Linea Alba coming between them. Their breadth diminiſhes, and their thickneſs increaſes gradually from above downward. *Figure and Situation in general.*

98. The ſuperior Extremity of each Muſcle is fixed to a part of the lower Extremity of the Sternum, to the three loweſt true Ribs, and to the firſt falſe Rib, by the ſame number of Digitations, of which, that which is furtheſt from the Sternum is the broadeſt. *Inſertions.*

99. The body of the Muſcle lies in the Vagina, formed by the Aponeuroſis of the broad Muſcles of the Abdomen. Exteriorly it is divided into ſeveral Portions reſembling diſtinct Muſcles placed endwiſe, by tranſverſe Tendons termed Enervations, which commonly are all above the Umbilicus, very ſeldom below it, and they adhere very cloſe to the Vagina.

100. These Inſertions are pretty irregular. They do not always penetrate the whole thickneſs of the Muſcle, and in that caſe they do not at all appear, or but very little, on the inner Surface. Sometimes thoſe which are ſeen on the outer Surface do not run quite croſs the whole breadth of the Muſcle.

101. The lower Extremity of this Muſcle is narrower than the upper, and ends in a thin Tendon fixed in the Internal Labium of the upper Edge of the Os Pubis near the Symphyſis, and there it touches the Tendon of the other Rectus.

102. Above the Umbilicus theſe two Muſcles are at ſome diſtance from each other, according to the breadth of the Linea Alba; but below it they come nearer, the Linea Alba being there narrower, and near their lower Extremity that line is almoſt intirely hid by their thick Edges.

### §. 4. *Muſculi Pyramidales.*

*Situation in general and Figure.*

103. At the lower part of the Recti we meet commonly with two ſmall Muſcles, which at firſt ſeem to be a Portion or Appendix of the former. They are named Pyramidales from their figure, and by Falloppius, Succenturiati.

*Inſertions.*

104. At the lower extremity they are broad and thick, being there fixed to the upper Edge of the Oſſa Pubis, immediately before the Recti. They decreaſe gradually in breadth and thickneſs as they aſcend, and end by a point in the Linea Alba, a little way below the Umbilicus.

105. They are partly incloſed within the Vagina of the Recti, running cloſe by each other along the Linea Alba, to which they are fixed at different diſtances by Oblique Tendinous Indentations, the uppermoſt of which are ſometimes very long.

106. Sometimes theſe Muſcles are wanting, and then the lower Extremities of the Recti are thicker than uſual. Sometimes there is only one Pyramidalis, and ſometimes they are not both of the ſame ſize and length. We very rarely meet with three in one ſubject.

### §. 5. *Tranſverſales.*

*Figure and Situation in general.*

107. The Tranſverſe Muſcles are nearly of the ſame breadth with the Obliques. Their name is taken from the Direction of their Fibres, and each of them is fixed to the Ribs, above; below, to the Os Ilium and Ligamentum Falloppi; before, to the Linea Alba; and behind, to the Vertebræ.

108. The upper part of this Muſcle is fixed to the lower part of the inner Surface of the Cartilages of the two loweſt true Ribs, and of all the five falſe Ribs, by fleſhy Digitations, the Fibres of which run more or leſs tranſverſely toward the Linea Alba, at ſome diſtance from which they become Tendinous. Theſe Digitations meet, and exactly correſpond with thoſe of the Diaphragma, but never mix with them in the Human Body.

109. The middle part is fixed to the three firſt Vertebræ of the Loins, by a double Aponeuroſis or two Tendinous Planes, one Internal or Anterior, the other External or Poſterior. The Internal is inſerted in the Tranſverſe Apophyſes, the External in the Spinal Apophyſes and Interſpinal Ligaments, being cloſely united to the Tendinous Expanſions of the neighbouring Muſcles; and the external Planes of both Tranſverſales appear to be continuous, their common Inſertion in the Spinal Apophyſes by no means hindering them from ſliding like a Girth, towards either ſide on the Proceſſes juſt mentioned.

110. The internal and external Planes having incloſed in their Duplicature, the Muſculus Sacro-Lumbaris and Quadratus Lumborum unite in one ſtrong Aponeuroſis at the Edges of theſe Muſcles. From this Aponeuroſis ariſes the middle and greateſt part of the fleſhy Portion of the Tranſverſalis, which, together with the ſuperior part, advances toward the Linea Alba, and at ſome diſtance from it becomes Tendinous.

111. The inferior part of this Muſcle is fixed by an Inſertion wholly fleſhy to the internal Labium of the Criſta Oſſis Ilium, and to a great part of the Ligamentum Falloppii. From thence many of it's Fibres run towards the Linea Alba, the reſt to the Os Pubis, all of them becoming more or leſs Tendinous before their Inſertion.

112. It is commonly ſaid that there is a Separation in the fleſhy Fibres of this portion behind that ſuppoſed to be in the Internal Oblique, for the paſſage of the Spermatick Veſſels, &c. There is indeed a ſort of Opening, but it is ſo very near the Internal Oblique, as to make it very doubtful at firſt ſight, whether it be formed by a Separation of the Fibres of the Tranſverſalis, or lies between the fleſhy Edges of that Muſcle, and of the Obliquus Internus, which after a careful Examination appears to be the caſe.

113. This Proximity makes it no eaſy matter for many Anatomiſts to determine whether the fleſhy Fibres of which the Cremaſter Muſcle partly conſiſts, belong entirely to the Internal Oblique, or whether ſome of them do not likewiſe come from the Tranſverſalis, as others do from the Ligamentum Falloppii.

114. The middle part of the fleſhy Plane of this Muſcle ends in a very broad Aponeuroſis cloſely adhering to that of the Obliquus Internus, the Vagina or Duplicature of which, it ſtrengthens interiorly, as that of the outer Oblique does exteriorly. Afterwards this Aponeuroſis reaches the Linea Alba, and joins that of the other Tranſverſalis by a particular ſort of Intertexture, without mixing either with the Internal Oblique or with the Peritonæum. The whole Aponeuroſis of the three parts of this Muſcle, from the fleſhy Fibres to the Linea Alba, repreſents a kind of Creſcent, and it was for this reaſon that the Ancients have ſaid that it terminated forward in a Semilunar Line.

### §. 6. *Connexion of the Obliqui and Tranſverſales.*

115. These three Muſcles are not only united by their lower Edges, and inſerted together in the Ligamentum Falloppii, but alſo braced by the Adheſion of the Faſcia Lata to that Ligament, and by the Connexion of it's Ligamentary Fibres with the Tendon of the External Oblique. This place is commonly called the Tendinous Arch of the Muſcles of the Abdomen, becauſe it appears in this ſhape when the Faſcia Lata is removed. This Connexion is ſtrengthened by a very thin Expanſion of Tendinous Filaments which decuſſate the Aponeuroſis of the Obliquus Externus, and reaching all the way to the Fiſſure, ſtrengthen the upper Edge thereof in the manner already ſaid.

116. When this Tendinous Expanſion is ſeparated from the Aponeuroſis of the External Oblique, in young ſubjects and in Women the Opening does not any more appear like a Ring, but ſimply as a void ſpace left by the ſeparation of the Tendinous Fibres. This Expanſion ſeems to be formed by a continuation partly of the Tendinous Fibres of the Obliquus Externus, and partly of thoſe of the Faſcia Lata.

117. The two Oblique Muſcles and the Tranſverſalis of each ſide, are diſpoſed in a very ſingular manner with relation to their fleſhy and Tendinous Portions; for the Tendons of ſome of them anſwer to the fleſhy parts of the reſt, The External Oblique is moſt Tendinous in the lower part and moſt fleſhy in the upper. The Internal Oblique is moſt Tendinous in the upper part and moſt fleſhy in the lower. The Tranſverſalis is moſt Tendinous in the middle and moſt fleſhy in the upper and lower parts. By this Diſpoſition theſe three Muſcles compoſe nearly an uniform Plane, the fleſhy and Tendinous Fibres being equally diſtributed through all it's parts.

118. It is commonly ſaid that the Linea Alba is only the Concourſe or place where theſe three pairs of Muſcles meet; but if we examine well, we find there an Intertexture not eaſy to be unravelled. One Portion of the External Oblique of one ſide ſeems to be continued with a Portion of the Internal Oblique of the oppoſite ſide, theſe four Portions making only two digaſtric Muſcles, which croſs each other obliquely. In the ſame manner, the two Tranſverſales by the union of their Aponeuroſis, form a third Digaſtric Muſcle; ſo that we have here three broad Faſciæ or Bands very artfully croſſing one another, formed indeed not by the whole Muſcles, but only by the middle Portions of them.

119. The Linea Alba is perforated by a ſmall round Hole near the middle of it's length; the Circumference of which is formed by Tendinous Fibres, twiſted and interwoven together in ſuch a manner, as to produce a regular and perfectly round Border. Before Birth, this Hole tranſmits the Funis Umbilicalis, and then it is pretty large; but in Adults it is very much contracted.

### §. 7. *Uſes of the Abdominal Muſcles.*

120. Of theſe uſes, ſome are common to all the Muſcles, others peculiar to each Pair, or to each Muſcle in particular.

121. The common uſes are to ſuſtain the Viſcera of the Abdomen, and to counterbalance the perpetual motions of ordinary Reſpiration, and thereby gently and continually to act on the Viſcera; which Action may be reckoned a ſort of Trituration, of great importance to the Animal Oeconomy. They compreſs the Abdomen in order to clear it of what ought to paſs off by the natural Outlets, to relieve the Stomach by Vomiting, from whatever might be hurtful to it; and laſtly to drive out by a violent Expiration whatever may incommode the Organs contained in the Thorax. *Common Uſes.*

122. These two kinds of Motion are carefully to be diſtinguiſhed. The firſt is purely mechanical, and in a manner paſſive; the other is arbitrary and really active.

123. In the firſt, the Viſcera preſſed by the Diaphragm in Inſpiration, force theſe Muſcles outward on all ſides, overcoming their natural Spring; but the Diaphragm being relaxed in Expiration, and yielding to the Viſcera, they recover themſelves again. In the ſecond, theſe Muſcles really act, that is their fleſhy Fibres are contracted and ſhortened, and thereby they compreſs the Viſcera, eſpecially the Stomach and Inteſtines, forcing out by the neareſt Paſſages whatever is capable of Expulſion.

124. In this latter caſe the Diaphragm acts while the Abdominal Muſcles are in Contraction, and thereby concurs in an univerſal Compreſſion of the Belly; but in the firſt caſe it does not act, as ſhall be fully ſhewn hereafter.

125. The particular Diſpoſition of the fleſhy and Tendinous Portions of the Obliqui and Tranſverſales, renders this Compreſſion uniform, and thereby the Muſcles reſiſt the force of the compreſſed Viſcera almoſt equally on all ſides.

126. The Muſculi Recti ſerve to ſupport the Trunk of the Body when inclined backward, and to bend or bring it forward again; to raiſe the Body up when lying; and laſtly, to climb. They ſerve, I ſay, to bend the Trunk when inclined backward or laid down; for when we ſtand ſtrait, they have no hand in bending the Body forward, except we be ſtriving to overcome ſome Reſiſtance. The Weight of the Thorax, Head and ſuperior Extremities, joined to the determinate Relaxation of the Poſterior Muſcles of the Back and Loins, produce this effect in all other caſes, as has been already mentioned in the general Obſervations on the Action of the Muſcles. *Proper Uſes.*

127. I am not as yet convinced that the Recti can contribute any thing to the arbitrary Compreſſion of the Abdomen, which has been already mentioned as one common uſe of all theſe Muſcles.

128. The Pyramidales ſeem only to aſſiſt the Action of the Recti; though when we conſider the Oblique Direction of their Fibres toward the

Linea Alba, there may be ſome reaſon to think that they compreſs the Bladder, eſpecially when very full of Urine, as *Falloppius* has remarked. The lower Portions of the Internal Obliques and Tranſverſales may perhaps contribute ſomething to this effect; for when contracted, they form a flat tight kind of Girth, by the middle of which the Superior Extremities of the Pyramidales are kept immoveable, while their Bodies being ſhortened and flattened by contracting, preſs upon the Bladder.

129. The Oblique Muſcles are capable of acting by diſtinct Portions. Their Poſterior Portions have nearly the ſame uſes on each ſide as the Recti have before; that is, they ſerve to ſupport the Trunk on one ſide when it is inclined to the other; to bend the Body to that ſide on which they lie, and to raiſe one ſide of the Pelvis or one Hip, while the other is well ſupported.

130. The Superior and Anterior Portions of the External Oblique of one ſide, together with the Inferior Portions of the Internal Oblique of the other ſide, ſerve to turn the Thorax upon the Pelvis as upon a Pivot, the Pelvis remaining fixed and immoveable by ſitting. This Motion may be termed the Rotation of the Thorax on the Pelvis.

131. When we ſtand and turn the Thorax to each ſide in the ſame manner, this Motion is not at firſt the Rotation already mentioned; for the Feet remaining then fixed, the Legs and Thighs turn to one ſide and carry the Pelvis along with them; but this Motion being carried as far as is poſſible, and the Pelvis being conſequently in a manner fixed, the Rotation of the Thorax then takes place, by means of the two oppoſite Oblique Muſcles in the manner already ſaid.

132. When all the Portions of theſe four Muſcles act together, they may aſſiſt the Recti in great Efforts; as for inſtance, when with the Arm or Breaſt we puſh forward a very heavy Body, or drag it after us.

133. The Tranſverſales ſeem to have no other uſe than that of Bracing or Girding the Abdomen in different degrees; and this they may do either by their whole Plane, or by different Portions thereof, and theſe again may gradually ſucceed each other. For inſtance, the Superior Portion may contract ſeparately, while the Inferior Portion is totally relaxed, as I have often obſerved in my ſelf.

134. There are ſtill other uſes belonging to theſe Muſcles, but they cannot be intelligibly explained till ſeveral other Muſcles have been deſcribed.

## ART. III.

### *The Muſcles which move the Bones of the Shoulder upon the Trunk.*

135. Of theſe Muſcles, ſome are inſerted in the Bones of the Shoulder, others move theſe Bones on the Trunk without being fixed in them.

136. The Muſcles which move the Scapula and Clavicula on the Trunk by being inſerted in them are commonly the ſix following.

1. *Trapezius.*
2. *Rhomboides.*
3. *Angularis*, called commonly *Levator Scapulæ proprius.*
4. *Pectoralis Minor.*
5. *Serratus Major.*
6. *Subclavius.*

137. The Muſcles, which without being inſerted in the Scapula and Clavicula, move them upon the Trunk, and which therefore may be reckoned Aſſiſtants to the former, are two in number, both belonging to that Claſs of Muſcles by which the Os Humeri is moved on the Scapula, viz.

1. *Pectoralis Major.* 2. *Latiſſimus Dorſi.*

138. The Scapula in particular, beſides it's Motions upon the Trunk, may alſo be moved upon the Os Humeri, by means of ſome of the Muſcles which move the Os Humeri on the Scapula, as we ſhall ſee hereafter.

139. In each Claſs of theſe Muſcles I ſhall only deſcribe thoſe which are actually inſerted in the Bones belonging to it, leaving to another Claſs the Muſcles which move thoſe Bones without being fixed to them. I ſhall in this place, for inſtance, explain only the ſix Muſcles firſt named, and refer the other two to the Muſcles which move the Os Humeri on the Scapula.

### §. 1. *Trapezius.*

140. The Trapezius is a large, broad, thin, fleſhy Plane, ſituated between the Occiput and lower part of the Back, and from thence extending to the Shoulder in the Figure of a large irregular Square. From this Figure the ancient Greeks took it's name, and together with the Trapezius of the other ſide it forms a kind of Lozenge. *Situation in general and Figure.*

141. Above, it is fixed in the Superior Tranſverſe Line of the Os Occipitis, by a thin ſeries of fleſhy Fibres, reaching to the Muſculus Occipitalis, and appearing to cover that Muſcle by a kind of Aponeuroſis. Behind, it is fixed to the five Superior Spinal Apophyſes of the Neck, by means of the Poſterior Cervical Ligament, and immediately to the Extremities of the two loweſt Spinal Apophyſes of the Neck, and of all thoſe of the Back. *Inſertions.*

142. These Inſertions are by ſmall and very ſhort Tendinous Fibres, except between the ſixth Apophyſis of the Neck, and the third of the Back incluſively, where theſe Fibres are ſomething longer, and form a ſmall Aponeuroſis in form of a Creſcent, which with that on the other ſide repreſents a kind of Ellipſis pointed at both ends. At the lower Spinal Apophyſis of the Back theſe Inſertions are likewiſe Tendinous, and form

a ſmall Triangular Plane, which, together with that of the other ſide, repreſents a Square.

143. From all theſe Inſertions, the fleſhy Fibres run in different Directions and terminate by one continued Inſertion in about one third part of the Clavicula, in the Poſterior Edge of the Acromium, and through the whole Superior Labium of the Spine of the Scapula, all the way to the ſmall Triangular Surface in that Spine, over which Surface the Fibres paſs and ſlide freely, without being fixed therein.

144. The Directions of all theſe Fibres are theſe: The Superior run obliquely downward from the Occiput to the Clavicula: The next to theſe run a little leſs obliquely, and together with ſome of the Superior are fixed in the Superior Articular Ligaments of the Shoulder, and in the Acromium. Here the Muſcle forms a kind of Angle included in that formed by the Acromium and Extremity of the Clavicle.

145. The reſt of the Fibres that come from the Neck and thoſe from the Superior Spines of the Back, are fixed in the Spine of the Scapula, reaching within an inch of the ſmall Triangular Surface, becoming gradually leſs Oblique or more Tranſverſe as they deſcend.

146. Lastly, The Fibres which come from all the other Spinal Apophyſes of the Back, contract like Radii tending toward a Center, and are inſerted in the Extremity of the Spine of the Scapula, paſſing over the ſmall Triangular Space, the Superior being more or leſs Tranſverſe, and the reſt becoming gradually more and more Oblique running from below upward.

147. This Muſcle covers immediately the Splenius or Maſtoïdæus Superior, part of the Complexus Major, the Angularis, Rhomboides, and part of the Latiſſimus Dorſi. The common Inſertion of the two Trapezii in the Cervical Ligament is the reaſon that in pulling either of them toward one ſide of the Neck, the other will follow it a little beyond the Spinal Apophyſes.

### §. 2. *Rhomboides.*

*Situation in general.*

148. This Muſcle is a thin, broad and obliquely ſquare fleſhy Plane, ſituated between the Baſis of the Scapula and the Spina Dorſi; and it is from it's Figure that it has been termed Rhomboides.

*Diviſion and Inſertions.*

149. It may be divided into two Portions, one Superior, the other Inferior, which ſometimes appear ſeparate. The Superior Portion which ſeems in ſome ſubjects to be made up of two, is fixed by an Inſertion wholly fleſhy in the two or three loweſt Spinal Apophyſes of the Neck, and by a Tendinous Plane in the three or four uppermoſt Spinal Apophyſes of the Back.

150. These two Portions, of which the Inferior is by much the broadeſt, being united, are inſerted in the Edge of the Baſis Scapulæ, from the ſmall Triangular Space to the Inferior Angle, the Superior Portion covering a ſmall part of the Inſertion of the Angularis.

151. This whole Muſcle is covered by the Trapezius, and covers immediately the Serratus Poſticus Superior, being joined to each of theſe Muſcles by a Filamentary or Cellulous Subſtance. *Particular Situation.*

### §. 3. *Angularis, vulgo Levator Scapulæ Proprius.*

152. This is a long and pretty thick Muſcle, about two Fingers in breadth, lying above the Superior Angle of the Scapula, along the Poſterior Lateral Part of the Neck of that Bone. *Situation in general.*

153. It is inſerted above in the Extremities of the Tranſverſe Apophyſes of the four firſt Vertebræ of the Neck, by four fleſhy Branches ending in ſhort Tendons, ſometimes the ſecond, ſometimes the third, or both, and ſometimes the fourth of theſe Branches is wanting; theſe defects being made up by the largeneſs of the reſt. *Inſertions.*

154. From thence theſe Branches run down a little obliquely, and then uniting together, they are inſerted in the Superior Angle of the Scapula, and in the Edge of it's Baſis from thence to the ſmall Triangular Space, being there covered a little by the Rhomboides.

155. This Muſcle is eaſily divided into two through it's whole length. It is covered by the Trapezius, and it's Inſertions in the Neck are ſometimes mixed with thoſe of the neighbouring Muſcles. *Particular Situation.*

### §. 4. *Pectoralis Minor.*

156. This is a ſmall fleſhy Muſcle, ſomething of a Triangular Shape, ſituated at the Superior, Lateral and Anterior Part of the Thorax. *Situation in general.*

157. By it's Baſis it is inſerted in the External Labium of the upper Edge of the ſecond, third, fourth and fifth true Ribs, near their Union with the Cartilages, by the ſame number of Digitations or ſeparate fleſhy Portions, becauſe of the Intervals between the Ribs; and for that reaſon it has been called Serratus Minor Anticus. *Inſertions.*

158. From thence theſe Portions run up more or leſs obliquely, toward the Shoulder, and form a fleſhy Belly which contracts as it paſſes before the two firſt Ribs, and then becoming a ſhort, flat and broad Tendon, is inſerted in the upper part of the Apophyſis Coracoides of the Scapula, reaching all the way to the Point of that Proceſs.

159. This Muſcle is covered by the Pectoralis Major, and adheres very cloſely to the External Intercoſtal Muſcles. The Digitations commonly taken notice of, cover and hide ſeveral others, by which the number of Fibres and thickneſs of this Muſcle are increaſed. It's Tendon unites a little at the Apex of the Coracoide Apophyſis, with the Inſertion of the Coraco-Brachialis, and with that of one Portion of the Biceps. *Particular Situation.*

### §. 5. *Serratus Major.*

*Situation in general.* 160. This is a broad, fleſhy and pretty thick Muſcle, lying on the Lateral Part of the Thorax between the Ribs and Scapula by which it is covered. It's Figure is that of an irregular Square, it's greateſt breadth being in the back part where it terminates by Digitations of unequal lengths, in a Radicated Diſpoſition, their Extremities deſcribing an Arch or Curve; and from theſe Digitations it's name is taken.

*Inſertions.* 161. It is inſerted backward in the Internal Labium of all the Baſis of the Scapula from the Superior to the Inferior Angle. From thence running forward wholly fleſhy, it increaſes gradually in breadth, and is inſerted in all the true Ribs, and often in one or two of the falſe Ribs, by the ſame number of Digitations.

162. The Inſertion in the firſt true Rib is about five Fingers breadth from the Cartilage; in the ſecond, ſomething leſs; in the third about four Fingers breadth; in the fourth, three; in the fifth, two; in the ſixth, one; in the ſeventh, one half; and in the firſt falſe Rib, two Fingers breadth; but in all theſe Meaſures ſome Latitude is to be allowed. The breadth of each Inſertion in the Ribs is at leaſt an inch.

*Diviſion and particular Situation.* 163. Though the Digitations of this Muſcle give it a Radiated Appearance from the Scapula to the Ribs, yet theſe Radii do not at all lie in that Diſpoſition which at firſt ſight we would be apt to imagine. The Muſcle is made up of two Planes, one great, the other ſmall.

164. The ſmall Plane looks like a diſtinct narrow Muſcle, cloſely adhering to the Superior Edge of the great Plane. It is fixed by one Extremity under the Superior Angle of the Scapula, and by the other to the firſt Rib by a ſmall Inſertion, and to the ſecond Rib by a broad Inſertion. This Plane is eaſily ſeen by turning the Scapula forward, having firſt ſeparated the Rhomboides; but when that is turned back, the Pectoralis Minor being firſt cut off, this Plane does not appear, being covered and hid by the broad one.

165. The broad Plane may be divided into two Portions, one Superior and one Inferior, adhering to each other by their Edges.

166. The Superior Portion is thin, and takes up about three quarters of the Baſis of the Scapula, reckoning from the Superior Angle. From thence it contracts by ſmall degrees, and forms two Digitations very like thoſe of the ſmall Plane, which they cover by their Inſertions in the two firſt true Ribs, or in the ſecond and third, and ſometimes in all the three.

167. The Inferior Portion is fixed in the lower quarter of the Baſis Scapulæ, from whence it expands itſelf by ſix or ſeven very long fleſhy Digitations, which decreaſe in breadth as they deſcend and are inſerted in the manner already ſaid, in the ſix or ſeven Ribs which follow the two firſt. It muſt be obſerved, that the three firſt Digitations take up almoſt all this quarter of the Baſis Scapulæ, the three laſt being fixed preciſely in the

inferior Angle. The Extremities of the three or four loweſt Digitations mix Fibres with thoſe of the Obliquus Externus of the Abdomen.

168. The Direction of the Fibres and Digitations of the Serratus Major will be eaſily comprehended, by recollecting that the Ribs are inclined downward in different degrees from behind forward; for which reaſon the Fibres of the Superior Portion of the broad Plane, croſs over the Ribs at leſs acute Angles than thoſe below them, ſo that in the natural Situation of the Scapula, the loweſt of theſe Fibres, which run up very obliquely, croſs over the third, fourth and fifth true Ribs.

169. The upper Fibres of the inferior Portion of the broad Plane, run up proportionably more obliquely, and therefore croſs over more Ribs and at more acute Angles than the others which are leſs oblique; and though ſome of theſe run tranſverſely, yet the Ribs being oblique, they muſt croſs over ſome of them, though in a leſſer degree. The loweſt of theſe Fibres or Digitations run a little downward, and conſequently fall in more with the Direction of the Ribs, but not ſo much as may be imagined. Theſe Digitations are very ſmall and weak.

### §. 6. *Subclavius.*

170. This is a ſmall oblong Muſcle lying between the Clavicle and firſt Rib. It is fixed by one end in all the middle lower Portion of the Clavicle, at the diſtance of about an inch from each Extremity; and by the other, in the Cartilage and a ſmall part of the Bone of the firſt Rib. It ſeems likewiſe to adhere to the Extremity of the Clavicle next the Sternum, by a kind of broad thin Ligament.

## ART. IV.

### *The Muſcles which move the Os Humeri on the Scapula.*

171. THE Muſcles which are inſerted in the Os Humeri, and thereby move it upon the Scapula, are commonly nine in number, viz.

1. *Pectoralis Major.*
2. *Latiſſimus Dorſi.*
3. *Deltoides.*
4. *Supra-Spinatus.*
5. *Infra-Spinatus.*
6. *Teres Major.*
7. *Teres Minor.*
8. *Subſcapularis.*
9. *Coraco-Brachialis.*

172. The Pectoralis Major is inſerted in the Trunk and Clavicula; the Latiſſimus Dorſi in the Trunk and Scapula; the Deltoides in the two Bones of the Shoulder; and the other ſix Muſcles in the Scapula alone.

173. Two of theſe nine Muſcles may likewiſe move the Bones of the Shoulder on the Trunk; the other ſeven may move the Scapula on the Os Humeri.

174. The Muſcles which without being inſerted in the Os Humeri, may in ſome circumſtances move it upon the Scapula, are two in number, belonging to the Claſs of Muſcles which move the Bones of the Fore-Arm on the Os Humeri, viz.

10. *Biceps.*

11. *Anconæus Major*, commonly called *Extenſor Cubiti Major.*

Both theſe Muſcles may likewiſe move the Scapula on the Os Humeri, as ſhall be remarked in deſcribing them.

### §. 1. *Deltoides.*

*Situation in general and Figure.* 175. This is a very thick Muſcle covering the upper part of the Arm, and forming what is termed the Stump of the Shoulder. It is broad above and narrow below in a Triangular Form; and it's name is taken from the reſemblance it bears to the Greek Letter Δ Delta; but to make the compariſon hold, either the Letter or the Muſcle muſt be inverted, and the Muſcle flattened.

*Structure.* 176. It is made up of eighteen or twenty ſmall ſingle Muſcles in an oppoſite Situation with reſpect to each other, and united by middle Tendons, ſo that taken all together they form ſeveral Penniform Muſcles. The Outer Surface appears almoſt wholly fleſhy, but on the Inner Surface we ſee the ſeveral Tendons.

177. All theſe ſmall Muſcles are diſpoſed in ſuch a manner as to form a conſiderable extent at the upper part, from whence they contract gradually in breadth, till they end in a thick ſtrong Tendon, by which the whole Muſcle terminates in an Angle or Point.

*Inſertions.* 178. Above, it is fixed in the whole Inferior Labium of the Spina Scapulæ, in the Convex or Long Edge of the Acromium, and in the third part of the Anterior Edge of the Clavicle next that Apophyſis. It ſurrounds the Angle formed by the Articulation of theſe two Bones by a particular Slope and Fold contrived for that purpoſe.

179. From thence it runs down above one third of the length of the Os Humeri, where it is inſerted by a thick Tendon in the large Muſcular rough Impreſſion below the bony Ridge which goes from the great Tuberoſity of the Head of the Bone, and forms the higheſt Border of the Groove or Channel mentioned in the Deſcription of the Sceleton No 638.

180. The Inſertion ſeems to be immediately implanted in the ſubſtance of the Bone, paſſing through the Perioſteum, which is commonly the caſe of all Inſertions in theſe kinds of Impreſſions, Eminences, or conſiderable Tuberoſities. It lies below that of the Pectoralis Major, and a little more

forward. Some of the Fibres of this Muſcle are fixed in the Aponeuroſis common to all the Muſcles which cover the Arm.

*Diviſion.*

181. This Muſcle may be diſtinguiſhed into three principal Portions, one of which is fixed in the Spine of the Scapula, one in the Acromium, and one in the Clavicle. They are ſeparated from each other by a ſmall quantity of Fat or Cellular Subſtance chiefly near the Baſis of the Muſcle.

182. The middle and ſtrongeſt Portion runs down almoſt directly to it's Inſertion in the Os Humeri. The Lateral Portions ſeem to end ſooner, but it is only becauſe they turn inward toward the Bone, and thereby form the biggeſt and thickeſt part of the Tendon. The Anterior or Clavicular Portion ſends off ſome Fibres to the Bone, before it reaches the Tendon.

183. The Portion fixed in the Spine of the Scapula, ſends backward a thin Aponeuroſis, which is ſtrengthened by another Tendinous or Ligamentary Series of Fibres. This Aponeuroſis is fixed in the Baſis of the Scapula below the Spine, and from thence is extended toward the Inferior Angle. The other Series begins at the Spine, and ends near the ſame Angle at the beginning of the Inferior Coſta. Theſe, together with the Great Tendon, ſeem to contribute to the Formation of the Tendinous Expanſion which covers the Muſcles of the Arm.

*Particular Situation.*

184. At it's upper part this Muſcle joins the Inſertion of the Trapezius, and below, that of the Brachialis. Anteriorly it joins the Pectoralis Major, being diſtinguiſhed from it only by a ſmall Line of Fat or of Cellular Subſtance, and a ſmall Vein called Cephalica. It covers the Head of the Os Humeri, and adheres to the Capſular Ligament of the Joint, and it likewiſe covers the Inſertion of the Pectoralis Major.

### §. 2. *Pectoralis Major.*

*Situation in general and Diviſion.*

185. This is a large, thick and fleſhy Muſcle covering the Forepart of the Breaſt, from the Sternum where it is very broad, to the Axilla where it contracts in it's paſſage to the Arm. It is naturally divided into two Portions, one Superior and Small, which may be termed Clavicular; the other Inferior and Large, which we may call Thoracic.

186. The Clavicular Portion is fixed by a fleſhy Inſertion in almoſt half the Clavicle next the Sternum, ending under the Inſertion of the Sterno-Maſtoidæus. From thence it runs obliquely down toward the Axilla, contracting by ſmall degrees, and ends in a flat Tendon or Tendinous Band. In this paſſage, it borders on the Anterior Edge of the Deltoides, from which it is diſtinguiſhed only by a Fatty or Cellulous Line, and a ſmall Vein named Vena Cephalica.

187. The Thoracic Portion is broad and in ſome meaſure Radiated. It is fixed by it's Anterior Circumference in the Lateral part of the Outſide of the Sternum, in the Outſide of the Cartilages, and in a ſmall part of the Bones of all the true Ribs, and of the firſt and ſometimes the ſecond falſe Rib. All theſe Inſertions are like ſo many Digitations.

188. The Inſertions in the Sternum end by a great number of very ſhort Tendons which run toward the middle of the Bone, meeting and decuſſating thoſe from the ſame Muſcle on the other ſide. The Lower Inſertions are moſt diſtinctly digitated, and they mix with thoſe belonging to the Rectus and Obliquus Externus of the Abdomen, there being likewiſe ſeveral Faſciculi of Fibres common to the Pectoralis with theſe Muſcles. This Portion is alſo fixed to the Ribs by internal fleſhy Strata covered by the external Inſertions, and forming together with them, the thickneſs of the Muſcle.

189. From thence all the fleſhy Fibres contract in breadth and approach each other, in their paſſage to the Arm. The Superior Fibres run downward, joining thoſe of the Clavicular Portion; thoſe next them run leſs obliquely; the following more or leſs tranverſely, and the Inferior run upward, in the ſame manner. This whole Portion ends at length in a flat Tendon joined to that of the ſmall Portion, and folded back upon it in the following manner.

190. The inferior fleſhy Fibres of the Thoracic Portion, before they reach the Tendon in their paſſage to the Arm, are gradually turned inward under each other, and then run up behind the Extremities of the Superior Fibres. By this Turn, the lower part of the Tendon anſwers to the Superior fleſhy Fibres, the middle Fibres of both to each other, and the upper part of the Tendon to the lower fleſhy Fibres, and ſo on. Thus the Tendons of both Portions adhering cloſely by their flat ſides and united at their Edges, form a double Tendinous Plane, the Fibres croſſing each other. The Anterior or External Plane belongs to the Clavicular Portion; the Internal or Poſterior Plane to the Thoracic Portion.

191. The Tendon thus formed is inſerted according to it's breadth, at about one fourth part of the length of the Bone from the Head, in the bony Ridge of the great Tuberoſity, that is, in the outer Edge of the Groove or Channel, the Cavity of which it lines in conjunction with another Tendon, by a Stratum of very thin, ſhining, Tranſverſe Fibres. This Inſertion lies between that of the Tendon of the Deltoides which it touches, and that of the Latiſſimus Dorſi, which is on the other ſide of the Groove.

192. This Muſcle, together with the Deltoides, ſends off an Aponeuroſis, which joining that of the Biceps, is ſpread over the Muſcles of the Arm. It partly covers the Pectoralis Minor and Serratus Major, and by it's broad Tendon it covers tranſverſely the Brachial Channel and the Tendon of the Biceps lodged there. Laſtly, it forms the Anterior Border of the Hollow of the Axilla, as the Poſterior is formed by the Latiſſimus Dorſi.

## §. 3. *Latiſſimus Dorſi.*

*Situation in general.*

193. This is a broad, thin, and moſtly fleſhy Muſcle lying between the Axilla where it is very narrow, and the back on which it expands itſelf

by Radiated Fibres both in length and breadth, from the middle of the Back all the way to the lower part of the Regio Lumbaris; and from this Situation it has it's name.

194. It's Inſertions, without reckoning that in the Arm, are partly Tendinous and partly Fleſhy. In the firſt place it is ſometimes, but not always, fixed in the inferior Coſta of the Scapula near the Angle by a Faſciculus of fleſhy Fibres. In the next place it is fixed by an Aponeuroſis, in the Spinal Apophyſes of the ſix or ſeven, and ſometimes eight loweſt Vertebræ of the Back, in thoſe of all the Vertebræ of the Loins, in the Superior Spines and Lateral Parts of the Os Sacrum, and in the External Labium of the Poſterior Part of the Os Ilium. *Inſertions.*

195. Besides all this Tendinous Courſe, it is inſerted by fleſhy Digitations in the laſt four falſe Ribs. Theſe Digitations cover thoſe of the Serratus Inferior Poſticus, and mix with thoſe of the Obliquus Externus Abdominis, there being ſometimes Faſciculi of Fibres common to both Muſcles. It is not always fixed to the loweſt falſe Rib; and ſometimes that Inſertion is by a particular kind of Aponeuroſis which is pretty ſtrong. I have likewiſe ſeen it fixed to the firſt falſe Rib by a very ſmall thin Digitation.

196. From all theſe Inſertions the Fibres of this Muſcle tend in different Directions to the Arm. At the middle of the Back they are almoſt tranſverſe, and they become more and more oblique as they deſcend. Towards the Region of the Loins their Obliquity decreaſes again, and on the Ribs they are almoſt longitudinal. As they run up they contract in breadth, and under the Axilla they terminate in a flat Tendon, turned almoſt in the ſame manner as that of the Pectoralis Major, but more ſimply, and without any Adheſion between the two Planes. The upper Edge of this flat Tendon is turned inward, anſwering to the lower or Lateral Part of the Muſcle, and the lower Edge which hides the other by croſſing a little over it, anſwers to the upper or Poſterior Part of the Muſcle.

197. The Tendon thus formed is fixed in the Os Humeri a little below the ſmall ſuperior Tuberoſity, in the inner Edge of the bony Groove or Channel, the Cavity of which it alſo lines by a tranſverſe ſmooth Expanſion, nearly as is done by the Tendon of the Pectoralis Major from the other Edge, ſo that theſe two Tendons meeting by their Extremities in the Groove, appear in ſome meaſure to be continued with each other, I ſay, in ſome meaſure, becauſe the Tendon of this Muſcle is not ſo broad as that of the Pectoralis Major.

198. The Tendon of the Latiſſimus Dorſi is accompanied by another flat Tendon belonging to the Teres Major; but it is inſerted higher up than that other Tendon and nearer the Channel, ſo that the lower Edge of the Tendon of the Latiſſimus Dorſi may be ſaid to incroach on the upper Edge of the other Tendon. Theſe two Tendons communicate, by ſome Collateral Fibres, and are both ſtrengthened by the ſame Ligamentary Frænum, which runs down from the Inſertion of the Subſcapularis below that of the Teres Major, in deſcribing which Muſcle, I ſhall have occaſion again to mention this Frænum. *Connexion.*

*Particular Situation.*

199. This Muſcle is covered by the Trapezius, from the ſixth to the laſt Vertebra of the Back, and covers the Serratus Inferior Poſticus. It's Aponeuroſis is at firſt narrow, but increaſes in breadth as it deſcends between the Vertebræ and Os Ilium. It adheres ſtrongly to that of the Serratus Inferior Poſticus, and ſtill more to the Tranſverſalis, Sacro-Lumbaris and Longiſſimus Dorſi. This Muſcle, together with the Pectoralis Major, forms the Cavity of the Axilla.

### §. 3. *Teres Major.*

*Situation in general.*

200. This is a long, thick, flat Muſcle, ſituated a little obliquely between the inferior Angle of the Scapula, and the upper part of the Arm. This Muſcle and the Teres Minor are called round, though they are conſiderably broader they are thick; becauſe they come much nearer to that Figure, than any other Muſcle which moves the Os Humeri on the Scapula.

*Inſertions.*

201. It is fixed by it's Poſterior fleſhy Extremity in all the large Angular Surface on the Outſide of the Scapula, in the Inferior Coſta of that Bone and near the Angle. From thence it advances with Longitudinal Fibres toward the upper Quarter of the Os Humeri, terminating in a broad flat Tendon intermixed with ſome fleſhy Fibres, which at the upper Edge are continued all the way to the Inſertion, lying in the ſame Place with the Tendon.

202. It is inſerted by it's Anterior Extremity at the lower part of the bony Ridge of the ſmall Tuberoſity, along the Edge of the Channel, almoſt oppoſite to, and ſometimes a little lower than the Inſertion of the Pectoralis Major. It lines the Cavity of the Channel by a Tendinous Elongation, which joins that from the Pectoralis, and ſeems to be continued with it. This Inſertion is below that of the Latiſſimus Dorſi, with which it communicates by a ſmall Aponeuroſis.

203. The Tendons of theſe two Muſcles, the Teres Major and Latiſſimus Dorſi, lie almoſt in the ſame Plane, as has been already obſerved, the upper Edge of the firſt running up a little way on one ſide the lower Edge of the latter, and the two Edges croſſing each other in a ſmall degree. The Tendon of the Latiſſimus Dorſi lies behind, and covers that of the Teres Major.

104. These two Tendons near their Inſertions have a Ligamentary Frænum belonging to them, which runs down from the Inſertion of the Subſcapularis, and is inſerted below that of the Teres Major. It covers the two Tendons, and keeps them cloſe to the Bone.

### §. 5. *Teres Minor.*

*Situation in general.*

205. This is a very fleſhy Muſcle, reſembling the Teres Major, but narrower and ſhorter. It lies above the laſt named Muſcle, between the Coſta Inferior of the Scapula and the Head of the Os Humeri.

206. It is fixed by one end to all the middle part of the Inferior Coſta of the Scapula, and to the long particular Surface immediately above that Coſta, reaching from the great Angular Surface near the Neck of the Bone. From thence it runs wholly fleſhy, till it changes into a flat Tendon which is inſerted in the Poſterior or Inferior Surface of the great Tuberoſity of the Head of the Bone, and likewiſe a little lower down. *Inſertions.*

207. It adheres very cloſe to the lower Edge of the Infra-Spinatus, and the Tendons of theſe two Muſcles are united; for which reaſon, the Ancients confounded them together, and did not look upon this as a particular Muſcle. It is covered by the Deltoides. *Connexion.*

### §. 6. *Infra-Spinatus.*

208. This is a tringular, fleſhy and pretty broad Muſcle, in ſome meaſure Penniform, filling the whole Infra-Spinal Cavity or Foſſa of the Scapula. *Situation in general.*

209. It is fixed in the Poſterior half of the Infra-Spinal Cavity or Foſſa, and to the correſponding part of the Baſis of the Scapula. *Inſertions.*

210. From thence ariſe a great number of ſhort fleſhy Fibres, which run more or leſs obliquely, and end in a middle Tendinous Plane, which terminates a little below the broadeſt part of the Spine of the Scapula, under the Root of the Acromium.

211. Then the fleſhy Fibres leaving the Bone, unite in one fleſhy Maſs, which paſſing under the Acromium over the Articulation of the Head of the Os Humeri, and adhering to the Capſular Ligament, terminates there in a flat broad Tendon, which adhering likewiſe to the Capſula, is afterwards inſerted in the greater middle Surface of the great Tuberoſity of the Head of the Os Humeri. At the place where the Fibres leave the Infra-Spinal Foſſa under the Acromium, there is a great quantity of Fat or Adipoſe Cells, between the Bone and the looſe Portion of the fleſhy Maſs.

212. This Muſcle appears double a little below the Spine and toward the Baſis of the Scapula, becauſe of the middle Tendinous Plane already mentioned. It ſeems likewiſe to be confounded with the Teres Minor, to which it is very cloſely joined. It's Tendon is united on one ſide with that of the Teres Major, and on the other with that of the Supra-Spinatus, and it is covered by the Poſterior Portion of the Deltoides. *Connexion.*

### §. 7. *Supra-Spinatus.*

213 This is a thick narrow Muſcle, in ſome meaſure Penniform, filling all the Supra Spinal Cavity of the Scapula. *Situation in general.*

214. It is fixed to all the Poſterior half of the Supra-ſpinal Foſſa, and ſometimes it's Inſertion reaches near the Neck of the Bone. There the Fibres leave the Surface of the Bone, and being, as it were, ſupported by the Fat or Cellulous Subſtance, paſs between the Acromium and Neck of the Scapula, under the Arch formed by the Acromium and Extremity of

the Clavicle, and under the Ligament between the Acromium and Apophyſis Coracoides; being afterwards inſerted in the ſuperior Surface of the great Tuberoſity of the Head of the Os Humeri, very near the bony Channel. This Muſcle is covered by the Trapezius.

### §. 8. *Coraco-Brachialis.*

*Situation in general.* 215. This is a long Muſcle lying on the inſide of the upper Half of the Os Humeri, that is, on that Side which anſwers directly to the Hemiſphere of the Head of the Bone, and to the Prominent Internal Condyle.

*Inſertions.* 216. It is fixed above to the Point of the Coracoide Apophyſis, between the Inſertions of the Biceps and Pectoralis Minor, by a Tendon, which as it deſcends adheres for a good way to the Tendons of theſe two Muſcles. Afterwards it becomes fleſhy, and is inſerted by a broad thin Extremity with a ſmall mixture of Tendinous Fibres, in the middle part of the Os Humeri, cloſe by the Ligamentary Frænum of the Latiſſimus Dorſi and Teres Major. It's Inſertion is continued down below the Frænum near the Internal Inter-Muſcular Ligament, to which it likewiſe adheres a little.

*Particular Situation.* 217. This Muſcle paſſes behind the Tendon of the Pectoralis Major; and as it is perforated in the middle to give paſſage to a Nerve, it has by ſome been termed Perforatus Caſſerii, that Author being the firſt who gave a particular Figure of it. The other name is taken from it's Inſertions.

### §. 9. *Subſcapularis.*

*Situation in general.* 218. This Muſcle is of the ſame breadth and length with the Scapula, of which it occupies all the Inner or Concave Side, and from this Situation it has it's name. It is thick, and made up of ſeveral Penniform Portions nearly in the ſame manner with the Deltoides.

*Inſertions.* 219. It is fixed in the internal Labium of the whole Baſis, and in almoſt the whole internal Surface of the Scapula; it's fleſhy Portions lying in the intervals between the bony Lines, when theſe are found. Near the Neck they leave the Bone, and form a very broad Tendon which is inſerted in the Surface of the ſmall Tuberoſity of the Head of the Os Humeri, cloſe by the bony Channel. The lower Edge of this Tendon probably ſends off the Ligamentary Frænum mentioned in the Deſcription of the Latiſſimus Dorſi, Teres Major, and Coraco-Brachialis.

*Particular Situation and Connexion.* 220. This Muſcle covers immediately the Serratus Major, being in a manner incloſed between it and the Scapula. The upper Edge of it's Tendon is joined to the lower Edge of that of the Supra-Spinatus, except at the upper part of the bony Channel where they give paſſage to one Tendon of the Biceps. It likewiſe adheres to the Capſular ligament. The Tendons of the Supra-Spinatus, Infra-Spinatus, Teres Minor and Subſcapularis, being all joined by their Edges, form a Sort of Cap which covers the upper part of the Head of the Os Humeri.

## ART. V.

### *The Muſcles which move the Bones of the Fore-Arm on the Os Humeri.*

221. THESE Muſcles are commonly reckoned ſix in number; two Flexors lying on the Foreſide of the Arm, called Biceps and Brachiæus Internus; and four Extenſors ſituated on the Backſide, named Extenſor Longus, Extenſor Brevis, Brachiæus Externus and Anconæus. The terms of Brachiæus and Extenſor Brevis are now become ſo indeterminate as to be often taken for one another; as likewiſe thoſe of Biceps Externus and Brachiæus Externus, which the moderns have ſubſtituted in the room of the former.

222. Of the two Anterior Muſcles, I name one ſimply Brachiæus with the Ancients, the other Biceps or Coraco-Radialis; and I call all the four Poſterior Muſcles Anconæi, diſtinguiſhing them afterwards by the Epithets of Major, Minor, Externus, Internus. Theſe four Muſcles might be reduced to two, the Anconæus and Triceps; which laſt may again be diſtinguiſhed into Major Longus or Medius, Externus and Internus.

223. The Diſpoſition and Names of theſe Muſcles, according to what has been ſaid, are theſe:

1. *Biceps ſive Coraco-Radialis.*
2. *Brachiæus*, called commonly *Brachiæus Internus.*
3. *Anconæus Major*, called alſo *Extenſor Cubiti Longus.*
4. *Anconæus Externus.*
5. *Anconæus Internus.*
6. *Anconæus Minor*, called ſimply *Anconæus.*

Sometimes the Anconæus Externus, and ſometimes the Internus is called Extenſor Cubiti Brevis, or Brachiæus Externus.

224. These Muſcles move not only the Fore-Arm on the Os Humeri, but alſo the Os Humeri on the Fore-Arm; neither are they all confined to theſe two Motions alone; for the Biceps or Coraco-Radialis and Anconæus Major may move the Os Humeri on the Scapula, and the Scapula on the Os Humeri. The Biceps by it's Inſertion in the Radius performs likewiſe the Motion of Supination, and that with much more force than the Muſcles commonly aſſigned for that Action by the Name of Supinatores.

225. The Motions of the Fore-Arm on the Os Humeri are not all performed by theſe ſix Muſcles alone. The Supinator Longus, as it is termed, aſſiſt therein, as has been already obſerved by *Heiſter*; and indeed it ſeems better fitted for that Motion than for Supination, as we ſhall afterwards ſee;

and for that reaſon I rank it among the auxiliary Muſcles, which move the Fore-Arm on the Os Humeri &c. by the Name of Radialis Longus.

### §. 1. *Biceps ſive Coraco-Radialis.*

*Situation and Conformation.* 226. This is a double Muſcle made up of two long fleſhy Bodies, more or leſs round, lying by the ſide of each other, on the middle Anterior part, and a little toward the Inſide of the Arm. Theſe two Bodies are ſeparated above each of them ending in a ſmall Tendon. As they run down they become contiguous, and afterwards cloſely united by one common broad Tendon. The Ancients who looked upon the two Superior Extremities as two Heads, gave this Muſcle the Name of Biceps, and from it's Inſertions I call it Coraco-Radialis.

*Inſertions.* 227. It is fixed by one of the Superior Tendons, in the Apex of the Coracoide Apophyſis of the Scapula, on one ſide of the Tendon of the Coraco-Brachialis, which adheres very ſtrongly to it. This Tendon of the Biceps is broader, ſhórter, and ſituated more internally than the other; the fleſhy Body belonging to this Tendon is longeſt, and conſequently runs higheſt up.

228. The other Superior Tendon is ſmaller and longer than the former, and the fleſhy Body belonging to it, ſhorter and more compounded. This Tendon is lodged in the bony Channel of the Os Humeri, being ſurrounded by a Membranous Vagina continued from the Capſular Ligament, and ending at the fleſhy Body where it is intirely cloſed.

229. At the upper part of the Groove, the Tendon runs between the Inſertions of the Tendons of the Supra-Spinatus and Subſcapularis; paſſes immediately over the Head of the Bone within the Capſular Ligament; then leaving the Joint between the two Tendons juſt mentioned, is covered by another ſhort Vagina, and is inſerted above the Glenoide Cavity, in the ſuperior Impreſſion of the Neck of the Scapula, near the Baſis or the Coracoide Apophyſis.

230. The two fleſhy Bodies thus ſeparately fixed by their ſuperior Tendons, approach by degrees as they deſcend, and before they reach the middle of the Os Humeri are cloſely united, forming afterwards a common Tendon of a conſiderable breadth, which is inſerted laterally in the Poſterior Edge of the Tuberoſity at the Neck of the Radius.

*Aponeuroſis.* 231. This inferior or common Tendon of the Biceps, a little before it's Inſertion, ſends off towards the internal Condyle, an Aponeuroſis which increaſing obliquely in breadth on the ſame ſide, covers the inner and back Parts of almoſt the whole Fore-Arm, eſpecially the Muſcles which lie upon the Ulna, where it is inſenſibly loſt. It likewiſe ſtrongly adheres to the Muſcles named Pronator Teres and Radialis Internus on the Foreſide of the Joint of the Elbow.

232. Both the fleſhy Bodies of the Biceps contribute to the Formation of this Aponeuroſis, each of the two portions of which the common Ten-

don is made up, furniſhing a Series of Tendinous Fibres, which covering the foreſide of the true Tendon, unite near the internal Condyle by a particular kind of Intertexture, and thus produce the Aponeuroſis.

### §. 2. *Brachiæus.*

233. This is an oblong, thick, and broad Muſcle, lying immediately on the Anterior Part of the lower half of the Os Humeri. The upper Part of it is forked or ſloped, and at the bending of the Joint of the Elbow the lower part contracts. *Situation in general.*

234. It is fixed to the Surface of the Os Humeri by a great number of fleſhy Fibres, from the lower Inſertion of the Deltoides, almoſt down to the two Foſſæ at the lower Extremity of the Bone, and from one Edge of the Foreſide of this lower Extremity to the other. The Fibres are for the moſt part Longitudinal, thoſe neareſt the Surface of the Muſcle being longeſt, the more Internal growing gradually ſhorter. *Inſertions.*

235. The Lateral Fibres are a little oblique, and this Obliquity increaſes in thoſe that lie loweſt. Theſe Lateral Fibres are partly fixed in the Intermuſcular Ligaments of the Os Humeri, of which Ligaments, that which lies toward the Internal Condyle is longer and broader than that toward the External Condyle. The loweſt of theſe Fibres are very oblique, and form on each ſide a kind of ſmall ſeparate Faſciculus.

236. In paſſing over the Joint all theſe Fibres contract in breadth, and afterwards end in a ſtrong flat Tendon inſerted in the Muſcular Impreſſion, which is directly below the Coronoide Apophyſis of the Ulna. This Muſcle adheres very ſtrongly to the Capſular Ligament, and ſome of it's fleſhy Fibres terminate therein.

237. The ſloped or forked ſuperior Extremity of this Muſcle embraces the large Tendon of the Deltoides. The internal Point of the Fork meets the inferior Inſertion of the Coraco-Brachialis; and the foreſide of the whole Muſcle is covered by the two fleſhy Bodies of the Biceps. *Connexion.*

### §. 3. *Anconæus Major.*

238. This is a long fleſhy Muſcle lying on the backſide of the Os Humeri. *Situation in general.*

239. It is fixed above by a ſhort Tendon to the inferior Impreſſion in the Neck of the Scapula, and to a ſmall part of the inferior Coſta of that Bone. From thence it paſſes between the Extremities of the Subſcapularis and Teres Minor, and having reached the backſide of the lower Extremity of the Os Humeri, it ends obliquely in a ſtrong broad Tendon, which adhering cloſely to the Capſular Ligament, is afterwards fixed by a broad Inſertion in the rough Tuberoſity on the upper ſide of the Olecranum. *Inſertions.*

240. It lies between the two Lateral Anconæi, and by it's Adheſions to them, a Triceps Muſcle is formed, of which this is the middle Portion. I *Connexion.*

call

call all theſe three Muſcles Anconæi, becauſe of their Inſertions in the Olecranum or Ancon.

### §. 4. *Anconæus Externus.*

*Situation in general.*

241. This is a long Muſcle lying on the outer part of the backſide of the Os Humeri, from it's Neck to the external Condyle.

*Inſertions. and Connexion.*

242. It is fixed above in the Neck of the Os Humeri under the inferior Surface of the great Tuberoſity, and under the Inſertion of the Teres Minor, but a little more backward. It runs down by the Anconæus Major, adhering ſtrongly to the Bone, except at that oblique Depreſſion, on account of which this Bone appears contorted, as was ſaid in the Treatiſe of the Sceleton. It is likewiſe fixed by ſome oblique Fibres in the external Inter-Muſcular Ligament.

243. From all this Space the fleſhy Fibres contract in breadth, being joined more or leſs obliquely to the outer Edge of the Tendon of the Anconæus Major, all the way to the Olecranum. The termination of theſe two Muſcles in the common Tendon, forms a very acute Angle and repreſents a ſort of Penniform Muſcle.

### §. 5. *Anconæus Internus.*

*Situation in general.*

244. This Muſcle is ſhorter and more fleſhy than the Anconæus Externus, and lies toward the inner part of the lower half of the Os Humeri.

*Inſertions. and Connexion.*

245. It is fixed above, under the lower Extremity of the Teres Major, but a little more backward, and to the internal Inter-Muſcular Ligament which makes a kind of Septum between this Muſcle and the Brachiæus. From thence the Fibres contracting in breadth, paſs toward the Tendon of the Anconæus Major, ſome of them running in between it and the Bone, and are inſerted in the Edge and inner Side of that Tendon.

### §. 6. *Anconæus Minor.*

*Situation in general.*

246. This is a ſmall Muſcle obliquely Triangular, lying in the oblong Foſſula on the outſide of the Olecranum.

*Inſertions.*

247. It is fixed by a ſmall but pretty ſtrong Tendon, in the lower part of the external Condyle of the Os Humeri. From thence the fleſhy Fibres run down obliquely in a Radiated form, and are inſerted in the Bottom and whole Poſterior Edge of the Foſſula already mentioned.

*Connexion.*

248. It is cloſely united to, and in ſome Subjects ſeems to communicate by ſeveral Fibres with the Muſcle termed Ulnaris Externus; and it's Tendon adheres very ſtrongly to that of the Anconæus Externus. Some Anatomiſts having confounded this Muſcle with the Ulnaris Externus have been ſeen to raiſe them together, looking afterwards in vain for the Anconæus Minor; which however is very eaſily diſtinguiſhed from the other by a Fatty or Cellulous Line.

ART.

## ART. VI.

### *The Muſcles which move the Radius upon the Ulna.*

249. THESE Muſcles are reckoned to be four in number, viz.

1. *Supinator Longus ſive Major.*
2. *Supinator Brevis ſive Minor.*
3. *Pronator Teres.*
4. *Pronator Quadratus.*

250. THESE Muſcles cannot move the Radius on the Ulna without moving it at the ſame time on the Os Humeri; but the Radius may be moved on the Os Humeri without being moved on the Ulna, and conſequently without the aſſiſtance of the Muſcles commonly aſſigned to the Radius.

251. I have already obſerved that the Supinator Longus does not belong more particularly to the Radius than to the Ulna; and that it is much better fitted for bending the Fore-Arm than for the Supination of the Radius, as ſhall be further ſhewn in deſcribing the uſes of the Muſcles.

252. THERE are ſome Caſes in which theſe Muſcles cannot perform the Motions either of Supination or of Pronation, without the aſſiſtance of thoſe that move the Fore-Arm on the Os Humeri, and even of ſome that move the Os Humeri on the Scapula, as ſhall be ſhewn in ſpeaking of the Uſes of Muſcles.

### §. 1. *Supinator Longus ſive Major.*

*Situation in general.*

253. THIS is a long flat Muſcle lying on the External Condyle of the Os Humeri, and on the Convex ſide of the Radius from one end to the other.

*Inſertions and Connexion.*

254. IT is fixed by fleſhy Fibres to the External Inter-Muſcular Ligament, and to the Criſta of the External Condyle of the Os Humeri, for five or ſix Fingers breadth above the Condyle, between the Brachiæus and Anconæus Externus. From thence it runs along the whole Convex ſide of the Radius, and is inſerted by a flat narrow Tendon, a little above the Styloide Apophyſis in the Angle between the Concave and flat Sides of the Extremity of this Bone.

### §. 2. *Supinator Brevis ſive Minor.*

*Situation in general.*

255. THIS is a ſmall thin fleſhy Muſcle, ſurrounding a great Portion of the upper third part of the Radius.

*Inſertions and Connexion.*

256. IT is fixed by one end to the lower part of the External Condyle of the Os Humeri, to the External Lateral Ligament of the Joint, to

the Annular Ligament of the Radius, and to part of the Lateral Eminence in the Head of the Ulna.

257. From thence it paſſes obliquely over the Head of the Radius, covering ſome part of it, and running down upon, and in ſome meaſure ſurrounding the Neck, it turns in under the Bicipital Tuberoſity, and is inſerted by the ſide of the Interoſſeous Ligament in the inſide of the ſuperior Quarter of the Bone, and even a little lower. In ſome Subjects we may obſerve the Marks of the paſſage of this Muſcle over the outſide of the Bone. It makes an Angle with the Pronator Teres, reſembling the Roman V.

### §. 3. *Pronator Teres ſive Obliquus.*

*Situation in general.*

258. This is a ſmall Muſcle, broader than it is thick, ſituated on the upper part of the Ulna oppoſite to the Supinator Brevis, with which it forms an Angle like the Letter V.

*Inſertions.*

259. It is fixed to the internal Condyle of the Os Humeri, partly by fleſhy Fibres, and partly by a Tendon common to it with the Ulnaris Internus. From thence it paſſes obliquely before the Extremity of the Tendon of the Brachiæus, and reaches to the middle part of the Convex ſide of the Radius, where it becomes flat, and is inſerted below the Supinator Brevis by an Extremity almoſt wholly fleſhy.

260. It is called Teres to diſtinguiſh it from the Quadratus. The name of Pronator Superior would be more proper, but that of Pronator Obliquus is the moſt proper of all.

### §. 3. *Pronator Quadratus ſive Tranſverſus.*

*Situation in general.*

261. This is a ſmall fleſhy Muſcle nearly as broad as it is long, lying tranſverſely on the inſide of the lower Extremity of the Fore-Arm.

*Inſertions.*

162. It is fixed by one Side or Edge in the long Eminence at the lower part of the internal Angle of the Ulna, and by the other in the broad Concave Side of the lower Extremity of the Radius.

263. It is wholly fleſhy, without any mixture of Tendinous Fibres. It is ſituated tranſverſely, but that extremity which lies on the Radius is nearer the Carpus than that on the Ulna. It is of a moderate thickneſs; and the Fibres neareſt the Surface are the longeſt, the reſt decreaſing in proportion as they lie near the Interval between the two Bones and the Interoſſeous Ligament.

264. It has a Ligamentary or Tendinous Frænum belonging to it, one end of which is fixed in the Interoſſeous Ligament, the other in the inner Edge of the Baſis of the Radius.

ART.

## ART. VII.

### *The Muſcles which move the Carpus upon the Fore-Arm.*

265. THE Muſcles that immediately perform the Motions of the Carpus on the Fore-Arm, are ſix in number, viz.

1. *Ulnaris Internus.*
2. *Radialis Internus.*
3. *Ulnaris Externus.*
4, 5. *Radialis Externus*, which is really two Muſcles, whereof one may be termed *Radialis Externus primus*, the other *Radialis Externus ſecundus*.
6. *Ulnaris Gracilis*, called commonly *Palmaris Longus*.

They have the names of Ulnaris and Radialis from their Situation, being all ſituated along the Ulna and Radius.

266. THESE Muſcles may likewiſe move the Fore-Arm on the Carpus, and in ſome caſes, they cannot without aſſiſtance perform the Motions attributed to them.

367. THE auxiliary Muſcles which aſſiſt in moving the Carpus on the Fore-Arm, belong to the Claſs of thoſe that move the Fingers as we ſhall ſee hereafter.

### §. 1. *Ulnaris Internus.*

268. THIS is a long Muſcle, fleſhy at it's upper Extremity and Tendinous at the other, ſituated on the outer part of the Ulna. ***Situation in general.***

269. IT is fixed by it's upper part in the backſide of the long or internal Condyle of the Os Humeri, in that part of the Olecranum which is next the Condyle, along the upper half of the Ulna very nearly; and to the middle common Tendon of the neighbouring Muſcle, termed commonly Profundus. ***Inſertions and Connexion.***

270. IT runs in the Direction of the external Angle of the Ulna, and ends by a long Tendon, on the Os Piſiforme or Orbiculare of the Carpus, reaching likewiſe to the Os Unciforme, being united to the Ligament common to theſe two Bones.

### §. 2. *Radialis Internus*

271. THIS is a long Muſcle very like the foregoing, but ſituated more obliquely. ***Situation in general.***

272. IT's fleſhy Portion is fixed by a ſhort Tendon, to the outer and upper ſide of the inner Condyle of the Os Humeri. From thence it paſſes ***Inſertions and Connexion.***

obliquely toward the Radius, and running along about two thirds of that Bone, it forms a long Tendon which continues in the ſame courſe, and at the lower Extremity of the Radius, paſſes under a particular Annular Ligament, and under the Inſertion of the Muſculus Thenar.

273. This Tendon is at length inſerted chiefly in the inſide of the Baſis of the firſt Metacarpal Bone, and often in the ſecond likewiſe, and a little in the firſt Phalanx of the Thumb, having firſt paſſed through the Channel of the Os Trapezium, which ſuſtains the Thumb.

## §. 3. *Ulnaris Externus.*

*Situation in general.* 274. This is a long Muſcle lying on the outſide of the Fore-Arm, fleſhy toward the Os Humeri and Tendinous toward the Carpus.

*Inſertions* 275. It is fixed above to the External Condyle of the Os Humeri, being there united to the Anconæus Minor; to the Annular Ligament of the Head of the Radius, and to the upper half of the external Angle of the Ulna. From thence it advances and forms a Tendon, which paſſes through the external Notch at the lower Extremity of this Bone, on one ſide of the Styloide Apophyſis.

276. The Tendon having afterward paſſed under a particular Ligament ſituated near the Os Cuneiforme of the Carpus, is inſerted in the outſide of the Baſis of the fourth Metacarpal Bone, ſending ſome Tendinous Filaments to the Baſis of the little Finger. It is likewiſe often fixed in the Baſis of the third Metacarpal Bone.

## §. 4. *Radialis Externus Primus & Secundus.*

*Situation in general.* 277. These are two Muſcles cloſely united together, appearing at firſt ſight like one Muſcle lying along the external Angle of the Radius, between the Os Humeri and the Carpus, being fleſhy near the former and Tendinous near the latter.

*Diviſion.* 278. In many Subjects we find theſe two Muſcles entirely diſtinct from one end to the other; and they may be named Radialis Externus Primus and Radialis Externus Secundus, regard being had to the Inſertion of their Tendons. Sometimes the two fleſhy Portions adhere cloſely together, appearing to make but one Body, but the Tendons are always diſtinct and ſeparate.

*Inſertions.* 279. The firſt is inſerted above, in the Criſta of the external Condyle of the Os Humeri, below the Inſertion of the Supinator Longus. The ſecond is inſerted in the ſame Condyle below the Inſertion of the firſt; and in the neighbouring Articular Ligament. From thence the two fleſhy Bodies run down very Cloſe together, and having reached the middle of the outſide of the Radius, each of them terminates in a long Tendon.

280. The two Tendons accompany each other to the Extremity of the Radius, and having paſſed under a particular Annular Ligament, they are divided as it were into two Cornua, from whence the Ancients who looked upon them as one Muſcle, gave it the name of Bicornis.

81. The

281. One of theſe Tendons is inſerted anteriorly in the Baſis of the firſt Metacarpal Bone, the other nearly in the ſame place of the ſecond Bone, which is the reaſon why I choſe to diſtinguiſh them by the names of Primus and Secundus. The Tendon of the firſt is ſometimes double, appearing like another Bicornis.

### §. 5. *Ulnaris Gracilis vulgo Palmaris Longus.*

282. This is a ſmall Muſcle lying between the Os Humeri and the Carpus on the inſide of the Fore-Arm, it's Body being ſmall and ſlender, it's Tendon very long and flat. *Situation in general.*

283. It is fixed by it's fleſhy Portion, in the ſmall Criſta of the inner Condyle of the Os Humeri, ſometimes cloſely united to the Ulnaris Internus. From thence it runs down fleſhy for ſome Space, turning a little obliquely towards the middle of the Fore-Arm and ends in a long, narrow, thin Tendon. *Inſertions.*

284. This Tendon paſſes down the middle of the Fore-Arm, over all the other Muſcles to which it ſlightly adheres, and advancing over the large internal Annular or Tranſverſe Ligament of the Carpus, is inſerted in the Surface thereof, ſending off ſome Radiated Filaments to the Aponeuroſis Palmaris.

285. I have found this Muſcle fixed to the Condyle of the Os Humeri by a Tendon about a Finger's breadth in length, to which the fleſhy Body was joined toward the middle of the Fore-Arm.

286. I have likewiſe ſeen the inferior Tendon inſerted in the Os Scaphoides of the Carpus, without communicating with the large Annular Ligament; and I have ſeen the Aponeuroſis Palmaris ariſe from this Ligament; from all which it may reaſonably be concluded, that that Aponeuroſis has no eſſential dependence on this Muſcle.

287. Sometimes this Muſcle appears to be only a production from the Ulnaris Internus.

### §. 6. *Palmaris Cutaneus.*

288. This Muſcle commonly known by the name of Palmaris Brevis, does not belong to this place, where my deſign is to mention no Muſcles but thoſe which are ſolely fixed in Bones. But as it is uſually ranked among the Muſcles belonging to the upper Extremity; and conſequently the Deſcription of it would never be looked for any where elſe, I have choſen to inſert it here.

289. It is a ſmall thin Plane of fleſhy Fibres ſituated tranſverſely, or more or leſs obliquely under the Skin of the large Eminence in the Palm of the Hand, between the Carpus and the little Finger; it's Fibres adhering to the Skin, and being in ſome meaſure interwoven with the Membrana Adipoſa.

290. These Fibres are fixed along the Edge of the Aponeuroſis Palmaris from the large Ligament of the Carpus toward the little Finger;

and they run in for ſome ſpace of the Plane of the Aponeuroſis, but without any Connexion with the Bones of the Metacarpus. Near the Aponeuroſis theſe Fibres are more or leſs Tendinous, and ſome of them often croſs each other. They are ſometimes ſo thin and pale, as hardly to be ſenſible; and in ſome Subjects this Muſcle ſeems to be divided into ſeveral parts.

## ART. VIII.

### *The Muſcles which move the Bones of the Metacarpus.*

291. THERE is one Muſcle which very viſibly moves the fourth Metacarpal Bone on the Os Unciforme of the Carpus, and thereby draws the third Metacarpal Bone along with it. This Muſcle, which may be termed Metacarpius, has been always hitherto looked upon as a Portion of a Muſcle belonging to the little Finger.

292. THE Metacarpal Bones are likewiſe moved on the Carpus by the Ulnares and Radiales, and by all the Muſcles in general that go to the Fingers, as by ſo many Auxiliaries.

293. THE number of Metacarpal Muſcles would be increaſed, were the firſt Phalanx of the Thumb looked upon as a Metacarpal Bone.

### *Metacarpius.*

*Situation in general and Inſertions.*

294. THIS is a ſmall very fleſhy Muſcle, ſituated obliquely between the large internal Annular or Tranſverſe Ligament of the Carpus, and the whole inſide of the fourth Metacarpal Bone.

295. IT is fixed by a ſmall ſhort Tendon to the Os Orbiculare, and to the neighbouring part of the large Ligament of the Carpus. From thence it's Fibres run more or leſs obliquely toward the inſide of the fourth Metacarpal Bone, in the outer Edge of which they are inſerted. The Fibres of this Muſcle are of unequal lengths, and extend all the way to the Articulation of the firſt Phalanx of the little Finger with the fourth Metacarpal Bone, but they have no manner of relation to that Finger.

## ART. IX.

### *The Muſcles which move the Fingers.*

296. THESE Muſcles may be divided into thoſe which move the Thumb, and thoſe which move the other four Fingers. Both theſe may again be divided into large or long, and ſmall or ſhort Muſcles. The Diſtinction of theſe Muſcles into common and proper is not ſuitable, becauſe theſe two terms are afterwards uſed as the proper names of ſome particular Muſcles which move the four Fingers.

297. I ſaid in the beginning of this Treatiſe that for Muſcles ſolely fixed in Bones, I would make uſe of no names taken from the Functions attributed to them. However, as the greateſt part of the Muſcles of the Fingers and Toes have proper names, and only a few of them are called Flexors or Extenſors, theſe names may ſtill be retained, provided they be looked upon only as proper names, as ſhall be ſaid at more length hereafter.

298. The Muſcles belong to this Article are theſe:

1. *Flexor Pollicis Longus.*
2. *Extenſor Pollicis Longus.*
3. *Thenar.*
4. *Meſothenar.*
5. *Antithenar.*
6. *Perforatus.*
7. *Perforans.*
8. *Extenſor Digitorum Communis.*
9. *Extenſor Indicis Proprius.*
10. *Extenſor Minimi Digiti Proprius.*
11. *Lumbricales.*
12. *Interoſſei.*
13. *Semi-Interoſſeus Indicis.*
14. *Hypothenar Parvus.*

### §. 1. *Flexor Pollicis Longus.*

*Situation and Inſertions.*

299. This is a long Muſcle, fixed by ſhort and oblique fleſhy Fibres to the inſide of the upper part of the Interoſſeous Ligament near the Radius, and along that Bone all the way down to the pronator Quadratus. There it terminates in a flat Tendon, which is inſenſibly formed from the very beginning of it's ſuperior Inſertion, by all the fleſhy Fibres of which the Muſcle is made up.

300. This Tendon having paſſed under a particular Ligament, runs in between the two Portions of the Thenar, and then into a ſort of Groove left between the two Seſamoide Bones fixed to the Baſis of the ſecond Phalanx of the Thumb, on that ſide which is turned to the Palm of the Hand. Afterwards the Tendon ends in the flat ſide of the third Phalanx near it's Baſis. It is incloſed in a ligamentary Vagina from the Annular Ligament to it's Inſertion, and it is divided or ſlit, ſo that it appears to be inſerted by two Extremities adhering together by their Edges.

### §. 2. *Extenſores Pollicis.*

*Diviſion and Situation in general.*

301. These are two very diſtinct Muſcles, the firſt or longeſt of which is ſometimes more, ſometimes leſs, and ſometimes altogether divided into two, in which caſe theſe Muſcles are three in number. They are ſituated obliquely between the Ulna and Convex ſide of the Thumb.

302. The Extenſor Primus is a long Muſcle, more or leſs double in the manner already ſaid. It is fixed above by fleſhy Fibres, firſt to the outſide of the Ulna near it's upper Extremity, below the Anconæus Minor and Inſertion of the Ulnaris Externus; next to the Interoſſeous Ligament under the Supinator Brevis; and laſtly, to the middle part of the outſide of the Radius.

303. From thence it runs down and paſſes anteriorly over the lower part of the Radius and Tendons of the Supinator Longus and Radialis Externus, and being gradually divided, it terminates in two long flat Tendons, more or leſs ſubdivided, which paſs together under a particular Annular Ligament, being only parted by Septa or Fræna belonging to that Ligament.

304. The firſt of theſe two principal Tendons is inſerted in the Edge of the Baſis of the firſt Phalanx, near the large Tranſverſe Ligament of the Carpus. When this Tendon is ſubdivided, the other Portion of it is fixed in that Bone of the Carpus which ſuſtains the Thumb. The other principal Tendon, which often belongs to a Muſcle intirely diſtinct from the former, is fixed in the Convex ſide of the Baſis of the ſecond Phalanx, where it joins the Tendon of the Extenſor Secundus. On account of theſe different Inſertions of the two Tendons, this Muſcle is by ſome authors deſcribed as two.

305. The Extenſor Secundus is ſhorter than the firſt. It is fixed to the Ulna below the former, and above the Inſertion of the Extenſor Indicis Proprius, and likewiſe to the neighbouring part of the Interoſſeous Ligament. From thence it runs down obliquely on the middle part of the Radius, where it has likewiſe a ſmall adheſion. Afterwards it paſſes through the ſmall Channel in the Styloide Apophyſis of the Radius, through the Annular Ligament belonging to the Tendons of the Radialis Externus, and over theſe Tendons, being parted from them by a ſmall Ligamentary Septum. It is inſerted in the Convex part of the third Phalanx near it's Baſis, having, as it paſſes over the ſecond Phalanx, joined the ſecond or collateral Tendon of the firſt Extenſor, more or leſs.

### §. 3. *Thenar.*

*Situation in general.*

306. This is a very thick fleſhy Muſcle in ſome meaſure Pyriform, lying on the firſt Phalanx of the Thumb toward the Palm of the Hand, the large Eminence in which is chiefly formed by it. It's name is taken from a Greek word which ſignifies to Strike.

307. It is fixed to the Bone which ſupports the Thumb, and to the neighbouring part of the great internal Annular or Tranſverſe Ligament of the Carpus. It is in ſome meaſure Bicipital, two diſtinct Portions anſwering to the two Inſertions already mentioned. As it runs along the firſt Phalanx theſe two Portions unite, and diminiſhing in thickneſs, are both inſerted by one Tendon in the lateral internal part of the Head of the firſt Phalanx, in the lateral part of the Baſis of the ſecond, and in the lateral Ligament of that Joint.

308. The void ſpace between the two portions of this Muſcle gives paſſage to the Tendon of the Flexor Pollicis Longus. That Portion which lies neareſt the Hollow of the Hand, is the largeſt, and it's Tendinous Extremity is inſerted in the firſt Seſamoide Bone ſituated at the Baſis of the ſecond Phalanx.

### §. 4. *Meſothenar.*

*Situation in general.* 309. This is a flat and nearly Triangular Muſcle lying between the firſt Phalanx of the Thumb, and the Bottom of the Palm of the Hand.

*Inſertions.* 310. It is inſerted by a very broad Baſis in the Ligament which connects the Os Magnum of the Carpus to that which ſupports the Thumb. It is likewiſe inſerted along the internal or angular part of that Bone of the Metacarpus, which ſupports the middle Finger, and in the ſmall Extremity of that which anſwers to the Index.

311. From thence the Fibres contracting to an Angle, terminate in a flat Tendon of different breadths, which is inſerted in that ſide of the Head of the firſt Phalanx of the Thumb, which is turned to the Hollow of the Hand, and in the neighbouring part of the Baſis of the ſecond Phalanx, by means of the ſecond Seſamoide Bone belonging to that Joint.

### §. 5. *Antithenar ſive Semi-Interoſſeus Pollicis.*

*Situation in general.* 312. This is a ſmall flat fleſhy Muſcle ſituated obliquely, between the firſt Phalanx of the Thumb, and firſt Bone of the Metacarpus.

*Inſertions.* 313. It is fixed by one end toward the Baſis of the firſt Metacarpal Bone, near the firſt Bone of the ſecond row of the Carpus. From thence it runs obliquely toward the Head of the firſt Phalanx of the Thumb, and is inſerted in the lateral external part of that Bone, or on that ſide which is turned to the firſt Metacarpal Bone. It croſſes over the Semi-Interoſſeus Indicis, this Muſcle lying toward the back of the Hand, and the Antithenar toward the Palm.

### §. 6. *Perforatus vulgo Sublimis.*

*Situation in general.* 314. This is a Muſcle of a conſiderable Volume lying along the inſide of the Fore-Arm, fleſhy for the greateſt part near the Articulation of the Fore-Arm with the Os Humeri, and near the Carpus terminating in four diſtinct Portions, which become the ſame number of long ſmall Tendons. The name of Sublimis has been given to it, becauſe it lies almoſt on the Surface of the Fore-Arm; and that of Perforatus from the Slits found near the Extremities of it's Tendons.

*Diviſion and Inſertions.* 315. It is commonly made up of four Muſcles cloſely united by their fleſhy Portions repreſenting there one large Body of Muſcles. It is fixed above to the ſuperior internal parts of the Ulna and Radius, (this laſt Bone being conſidered in it's natural Situation) and to that of the Interoſſeus Ligament. A little below the middle of the Fore-Arm, this large fleſhy Body is divided into four diſtinct Muſcles, which on the loweſt quarter of the Fore-Arm, end in four flat Tendons of different Sizes.

316. These four Tendons are incloſed in a common Membranous or Mucilaginous Vagina, which likewiſe furniſhes each Tendon with a parti-

cular thin Vagina. In this manner they advance to the Carpus, and paſs under the large annular tranſverſe Ligament. Beyond this Ligament they ſpread again in the Palm of the Hand, ſtill retaining their particular Vaginæ, and run between the Aponeuroſis Palmaris and Metacarpus toward the Fingers, ſeparating more and more by degrees. Sometimes there are at firſt only three Tendons, one of them being afterwards divided into two, in their paſſage to the Fingers; ſometimes they communicate by a kind of Detachment, with the Tendons of the Perforans.

317. HAVING reached the Heads of the Metacarpal Bones, they paſs under the four Arches or Fræna formed by the Furcæ of the Aponeuroſis Palmaris, and particular Septa of the great Tranſverſe Ligament of the Palm of the Hand; and then each Tendon having got beyond the Head of one Metacarpal Bone, and beyond the Baſis of the firſt Phalanx, enters the Ligamentary Vagina on the flat or inner ſide of that Phalanx, and is inſerted in the flat ſide of the ſecond Phalanx near it's Baſis, the Membranous Vagina accompanying it to it's Inſertion. The Ligamentary Vagina is ſtronger towards the Baſis than toward the Head of the firſt Phalanx.

318. IN paſſing a long the inſide of the firſt Phalanx, the Tendon is divided by a long Slit which gives paſſage to a Tendon of the Perforans, and from thence the names of theſe two Muſcles are taken.

319. THIS Fiſſure or Opening is contrived in a very ſingular manner; the Tendon is firſt of all divided in two flat Portions, and each Portion is contorted on the flat ſide of the Phalanx; ſo that the Edges which were neareſt become oppoſite, and the oppoſite Edges are joined together all the way to the Extremity of the Tendon. By this Contorſion the Fiſſure ſeems to form two ſmall oblique Grooves, which ſurround the Tendon, in oppoſite Directions, one Groove being covered by the Tendon, and the other covering it.

320. THIS is not all: The two Portions having formed this double Groove by their mutual Contorſion, are not united, only by ſimply approaching each other at their Extremities; for each Portion is at that place again divided into two others, ſmaller and ſhorter than the former; ſo that in all there are four narrow Portions; the two neareſt of which croſs each other, and join the other two; ſo that from the four narrow ones are formed two broad Portions anew, which are joined by their Edges, and afterwards inſerted in the Bone at a ſmall diſtance from each other.

### §. 7. *Perforans vulgo Profundus.*

*Situation in general and Diviſion.*

321. THIS Muſcle is very like the former, and it is ſituated much in the ſame manner, only it lies lower and is covered by the Perforatus. It is compoſed of four Muſcles, which at firſt ſeem to make but one Maſs, and afterwards terminate in four Tendons.

*Inſertions.*

322. THE fleſhy Portions of the firſt and largeſt and alſo of the ſecond are fixed in the ſuperior parts of the Ulna and Interoſſeus Ligament down to their middle; the fleſhy Portion of the third is joined to the Tendon of

the Ulnaris Internus by a ſort of common Aponeuroſis, and that of the fourth is fixed along the Ulna.

323. The four Tendons have often ſeveral ſmall collateral Tendons, ſometimes five in number, united to the Tendons of the neighbouring Muſcle, as they paſs under the large Annular Ligament of the Carpus; but the Tendons themſelves are ſeparated from the others by thin Septa, which form a kind of particular Rings. Being thus ſtrengthened they ſeparate, and running along the Palm of the Hand in diſtinct Membranous Vaginæ, like thoſe of the Perforatus by which they are covered, they enter the Ligamentary Vaginæ of the firſt Phalanges together with the former; and having paſſed through the Fiſſures thereof, and through the Ligamentary Vaginæ of the ſecond Phalanges, they are inſerted in the flat inner ſide of the third near their Baſis.

324. The Ligamentary Vaginæ of the ſecond Phalanges appear ſometimes ſtronger near the Baſis than near the Heads of the Bones.

### §. 8. *Extenſor Digitorum Communis.*

325. This is a compound Muſcle very much reſembling the Perforatus and Perforans, lying on the outſide of the Fore-Arm between the Ulnaris Externus and Radialis Externus. *Situation in general.*

326. It is fixed above by a Tendinous Extremity, to the poſterior and lower part of the external or great Condyle of the Os Humeri, and by a Tendinous Adheſion on each ſide, to the Ulnaris and Radialis Externus. It has likewiſe ſometimes a ſmall Inſertion in the Radius. It is divided into four Muſcles like the Perforatus and Perforans, four long ſlender ſmall Tendons. *Inſertions and Diviſion.*

327. Three of theſe Tendons paſs through the common external Annular Ligament of the Carpus; and the fourth which goes to the little Finger, and which has ſometimes it's fleſhy Portion diſtinct from the reſt, paſſes through a particular Ring of the ſame Ligament.

328. Afterwards theſe four Tendons ſeparate as they go to the Fingers, and in their paſſage communicate with each other by oblique Tendinous Series, chiefly near the Heads of the Metacarpal Bones. The Tendons of the middle and little Finger are ſometimes double, and yet communicate with the reſt.

329. Each Tendon having reached the Baſis of the firſt Phalanx, is ſlightly inſerted therein by ſome lateral Expanſions fixed in each ſide of the Baſis. From thence it advances to the Head of the ſame Phalanx, where it is divided into two flat Portions, which at the Articulation of the firſt Phalanx with the ſecond, leave ſome diſtance between them. About the Head of the ſecond Phalanx they unite again, and are fixed in the Convex ſide of the third Phalanx near it's Baſis. The Separation of the two Portions is in ſome ſort Rhomboidal, and each Portion is ſtrengthened by a common Tendon of the Lumbricales and Interoſſei. In the void Space between them are ſmall Tendinous Fræna, more or leſs tranſverſe.

### §. 9. *Extenſor Indicis Proprius.*

*Situation in general.*

330. This is a ſmall long Muſcle with a long ſlender Tendon, lying a little obliquely on the lower and outer half of the Fore-Arm between the Ulna and Fore-Finger.

*Inſertions.*

331. It is fixed by it's fleſhy Body a little higher than the loweſt third part of the outſide of the Ulna, below the Inſertion of the Extenſor Pollicis, and it has likewiſe a ſmall Adheſion to the Interoſſeus Ligament. From thence it runs down, ending in a diſtinct Tendon without any Communications, which having paſſed through the Annular Ligament of the Extenſor Communis, afterwards joins that Tendon which goes to the Index.

### §. 10. *Extenſor Minimi Digiti proprius.*

*Situation in general.*

332. This is a kind of collateral or auxiliary Muſcle of the Extenſor Communis, of which it appears almoſt always to be more or leſs a Portion.

*Inſertions.*

333. It is fixed along the ſuperior external half of the Ulna, from whence it's long ſmall Tendon runs down in company with the fourth Tendon of the Extenſor Communis, all the way to the little Finger, where it joins it, and is inſerted with it. Sometimes this Muſcle is wanting, in which caſe the Extenſor Communis ſends a double and ſometimes a triple Tendon to the little Finger.

### §. 11. *Lumbricales.*

*Situation in general.*

234. These are four very ſmall ſlender Muſcles lying in the Hollow of the Hand, in the ſame Direction with the Perforatus and Perforans.

*Inſertions.*

335. They are fixed by their fleſhy Bodies to the Tendons of the Perforatus on the ſide next the Thumb, near the large Annular Ligament of the Carpus. Near the Heads of the Metacarpal Bones they become very thin Tendons, which accompany thoſe of the Perforans through the Furcæ of the Aponeuroſis Palmaris. Then they paſs on to the ſame ſides of the firſt Phalanges and join the Tendons of the Extenſor Communis; each of them being connected with the neareſt Portion thereof, at the Articulation of the firſt Phalanx with the ſecond.

336. These Tendons are likewiſe united to ſome of the Interoſſei, and their Inſertions ſeem to vary in different Subjects; for though they lie generally on that ſide of the Fingers which is next the Thumb, yet if I am not miſtaken, I have obſerved the firſt inſerted in the Index on the ſide next the Thumb, the ſecond and third on each ſide the middle Finger, and the fourth in that ſide of the Ring Finger which is fartheſt from the Thumb.

## §. 12. *Interoſſei.*

*Situation in general and Diviſion.*

337. These are ſmall Muſcles lying between the Metacarpal Bones, and filling the three Interſtices left between them, both exteriorly or towards the back of the Hand, and interiorly or toward the Palm of the Hand. From this Situation they have the name of Interoſſei, and have been divided into External and Internal. They are commonly reckoned ſix in number, three External and three Internal, regard being had only to the fleſhy Maſſes in the Metacarpus, and to the ſix Tendinous Inſertions in the Fingers: but if we conſider the compoſition of theſe Maſſes, their number may be increaſed.

338. The external Interoſſei are ſtronger, more compound, and take up more Space between the Metacarpal Bones than the internal. Each of them is made up of two portions, one of which appears almoſt on a level with the Bones, the other hid, and which runs in upon the internal Muſcles.

339. The apparent Portion is in ſome meaſure Penniform, being fixed along the ſides of two Bones, and alſo by a ſmall Extremity to the neareſt Bone of the Carpus. The other Portion which lies hid appears more ſimple, and ſeems to be fixed only to the Baſes of the ſame two Bones.

340. Near the Heads of the Metacarpal Bones, theſe two Portions of each Muſcle end in broad flat Tendons, which, having reached the ſide of the firſt Phalanx of one Finger, are afterwards united with the neareſt Portion of the Tendon of the Extenſor Communis. One Portion is likewiſe inſerted in the Phalanx itſelf, by ſmall ſhort Tendons. Theſe Muſcles may therefore be reckoned Bicipital, eſpecially when the Tendons of the two Portions unite.

341. The firſt two external Interoſſei are for the moſt part inſerted in the middle Finger. They fill the Interſtices between the three firſt Metacarpal Bones, and ſurround the middle Bone all the way to the Hollow of the Hand. Their Tendons are fixed in both ſides of the firſt Phalanx, and in both ſides of the ſecond Tendon of the Extenſor Communis.

342. The third external Interoſſeus lies in the Interſtice betwixt the two laſt Metacarpal Bones, and is moſt commonly inſerted in the Ring Finger; it's Tendon being fixed in that ſide of the firſt Phalanx fartheſt from the Thumb, and in the correſponding Edge of the third Tendon of the Extenſor Communis. The fleſhy body of this Muſcle runs in between the two Bones toward the Hollow of the Hand.

343. The internal Interoſſei are more ſimple than the former, and do not lie ſo much between the Bones. The Tendon of the firſt is inſerted in the ſide of the firſt Phalanx of the Fore-Finger, next the little Finger, and in the correſponding Edge of the Extenſor Communis. The Tendon of the ſecond goes in the ſame manner to the ſide of the Ring Finger next the Thumb; and the third, to the ſame ſide of the little Finger.

344. There are therefore two external Interoſſei for the middle Finger, one for the Ring Finger, but none for the Fore and Little Finger. The Middle Finger has no internal Interoſſeus; but the Index, Ring Finger and Little Finger have each of them one.

345. The external Interoſſei appear ſometimes to be really double, the two Muſcles being ſeparated by a fatty Line; ſo that in ſome Subjects we have ſix internal Interoſſei. But the fleſhy Portions on each ſide of the ſecond Metacarpal Bone belong to the two firſt external Muſcles; and the fleſhy Portion on the ſide of the fourth Metacarpal Bone next the Thumb, belongs to the third external Interoſſeus, according to the diſpoſition in which I have deſcribed them.

## §. 13. *Semi-Interoſſeus Indicis.*

*Situation in general.*

346. This is a ſmall, ſhort, flat, fleſhy Muſcle, very like the Antithenar or Internal Semi-Interoſſeus of the Thumb. It is ſituated obliquely on one ſide of that of the Thumb, between the firſt Phalanx thereof, and firſt Matacarpal Bone.

*Inſertions.*

347. It is fixed by one end to the outſide of the Baſis of the firſt Phalanx of the Thumb, and a little to the Bone of that Carpus by which this Phalanx is ſupported; and by the other end it is fixed near the Head of the firſt Phalanx of the Index, on that ſide next the Thumb. It lies almoſt parallel to the Antithenar, croſſing over it a little; this Muſcle lying on the Convex ſide of the Hand, and the Antithenar on the Concave ſide.

## §. 14. *Hypothenar Minimi Digiti.*

*Situation in general.*

348. This is a ſmall and pretty long Muſcle lying on the backſide of the fourth Metacarpal Bone oppoſite to the Thumb, where together with the Metacarpius or Hypothenar Metacarpi, it forms that large Eminence over againſt the Thenar or that of the Thumb. It may be called Hypothenar Minor, and that of the Metacarpus, Hypothenar Major.

*Inſertions.*

340. It is fixed by one end in the Os Orbiculare of the Carpus, and a little to the neighbouring part of the large Annular Ligament. The other end terminates by a ſhort flattiſh Tendon fixed to that ſide of the Baſis of the firſt Phalanx of the little Finger which is turned from the Thumb. This Muſcle covers the Metacarpius a little, and they have both been looked upon as Portions of one Hypothenar.

## ART. X.

### *The Muſcles which move the Os Femoris upon the Pelvis.*

350. THESE Muſcles are commonly twenty two in number, ſixteen of which are inſerted in the Os Femoris, and ſix move it without being fixed to it.

351. THESE Muſcles only which are inſerted in the Os Femoris are reckoned to belong to the Thigh, and they are commonly ſaid to be fourteen in number, but it is eaſy to make out ſixteen very diſtinct from each other. Of theſe ſixteen three lie on the fore and upper part of the Thigh, viz.

§. 1. *Pſoas.* 2. *Iliacus.* 3. *Pectineus.*

352. ON the inſide of the Thigh are three, commonly reckoned one, by the name of Triceps, though according to the ancient language it has three Tails, as well as three Heads and three Bellies, and therefore might more properly be called Triplex.

4. *Triceps ſive Triplex Primus.* 5. *Triceps Secundus.* 6. *Triceps Tertius.*

353. THREE from the Buttocks, and are called,

7. *Glutæus Maximus.* 8. *Glutæus Medius.* 9. *Glutæus Minimus.*

354. THERE are ſix very ſmall Muſcles, more or leſs hid under the Glutæi, the four firſt of which are by ſome termed Quadrigemini. The particular names of theſe ſix are:

10. *Pyriformis.*
11. *Gemellus Superior.*
12. *Gemellus Inferior.*
13. *Quadratus.*
14. *Obturator Externus.*
15. *Obturator Internus.*

355. LASTLY, there is a ſmall anterior ſuperficial Muſcle, commonly but falſely termed Faſcia Lata, which is a large Membranous, Tendinous, or Ligamentary Covering, to which the greateſt part of this ſmall Muſcle is fixed: and therefore it ought not to be called by the name of that Membrane without reſtriction, that is, without the addition of Muſculus in this manner:

16. *Muſculus Faſciæ latæ ſive Muſculus Membranoſus.*

356. The ſix Muſcles which move the Os Femoris without being inſerted in it, belong to the Claſs of thoſe which move the Leg upon the Thigh, viz.

| | |
|---|---|
| 17. *Sartorius.* | 20. *Semi-Membranoſus.* |
| 18. *Rectus Gracilis.* | 21. *Semi-Nervoſus.* |
| 19. *Rectus ſive Gracilis internus.* | 22. *Portio Bicipitis longa.* |

357. All theſe Muſcles, whether inſerted or not inſerted in the Os Femoris, not only move that Bone on the Pelvis, but may alſo move the Pelvis on the Os Femoris.

*Faſcia Lata.* 358. The Faſcia Lata already mentioned ſurrounds more or leſs all theſe Muſcles. It is a Muſcular Ligament very conſiderable both for it's extent and ſtrength, being made up chiefly of two Planes of Fibres, of which the External are more or leſs Longitudinal; the internal more or leſs Tranſverſe. It is farther ſtrengthened in ſome places by a great number of other Fibres which augment it's thickneſs and form particular Expanſions. The Tranſverſe Fibres are much ſtronger than the Longitudinal.

359. It is fixed above to the Edge of the Criſta Oſſis Ilium from the large Tuberoſity, to the anterior Superior Spine; to the Ligamentum Falloppii, and to the Aponeuroſis of the Obliquus Externus of the Abdomen on which it runs up by a thin Lamina. It is likewiſe fixed in the lateral inferior part of the Os Sacrum, and to the neighbouring parts of the Ligaments by which that Bone is connected to the Oſſa Ilium and Iſchium.

360. From thence it advances over the Glutæi and Thigh between the Membrana Adipoſa and Muſcles, all the way to the anterior and outer parts of the Knee. It is very thin on the Patella, but may be ſeparated from it. It is likewiſe continued over the external anterior part of the Tibia, covering the Muſcles which lie there, and is ſtrongly inſerted in the Head and Criſta of that Bone, and in the upper part of the Fibula.

361. It ſends off Elongations which like ſo many Septa, run in between the Muſcles, and ſometimes meet in ſuch a manner as to form Vaginæ. It is ſtrongeſt on the anterior and outer parts of the Thigh, growing gradually thinner on the inner and back parts.

362. It is ſtrongly inſerted in the Linea Femoris Aſpera between the Vaſtus Externus and Biceps, forming a ſort of Septum between theſe Muſcles. It furniſhes particular Vaginæ to the Muſcles which lie on the inſide of the Thigh; and though theſe Vaginæ are thin, they are nevertheleſs pretty ſtrong, being chiefly made up of tranſverſe Fibres.

### §. 1. *Pſoas ſive Lumbaris Internus.*

*Situation in general.* 363. This is a long thick Muſcle ſituated in the Abdomen on the Lumbar Region, adhering to the Vertebræ of the Loins, from the Poſterior part of the Os Ilium to the Anterior part near the Thigh.

364. It is fixed above to the laſt Vertebra of the Back and to all thoſe of the Loins, that is, to the lateral parts of the Bodies of theſe Vertebræ, and to the Roots of their tranſverſe Apophyſes. The Inſertions in the Bodies of the Vertebræ are by a kind of Digitations, and are very little Tendinous. *Inſertions.*

365. From thence the Muſcle runs down laterally over the Os Ilium, on one ſide of the Iliac Muſcle, and paſſes under the Ligamentum Falloppii, between the anterior inferior Spine of the Os Ilium, and that Eminence which from it's Situation may be termed Ilio-Pectinea.

366. Before it goes out of the Abdomen it unites with the Iliacus, and is ſometimes fixed by a few fleſhy Fibres, in the outſide of the Eminence laſt mentioned. It afterwards covers the foreſide of the Head of the Os Femoris, and is inſerted in the forepart of the little Trochanter by an oblique Tendon, which is folded double from behind forward.

367. This Muſcle is ſometimes accompanied by another ſmaller Muſcle almoſt like it, called Pſoas Parvus, which I have ranked among the Muſcles of the Loins, becauſe it ſeldom reaches lower than the Pelvis.

### §. 2. *Iliacus.*

268. This is a broad thick Muſcle lying on the whole inſide of the Os Ilium. *Situation in general.*

369. It is fixed by fleſhy Fibres to the internal Labium of the Criſta Oſſis Ilium, to that of the Slope between the two anterior Spines, to the inſides of theſe Spines, to the Superior half of the inſide of this Bone, and to the neighbouring lateral part of the Os Sacrum. *Inſertions.*

307. All theſe Fibres contracting by degrees run obliquely towards the lower part of the Muſculus Pſoas, uniting therewith, and being fixed by a kind of Aponeuroſis to the outſide of it's Tendon all the way to the little Trochanter. They cover the Head of the Os Femoris, and ſome of the loweſt are inſerted in that Bone a little above and behind the little Trochanter, and others a little lower down.

371. On the outſide of the lower Extremity of the Iliacus, there is ſometimes a ſmall ſeparate Muſcle fixed immediately under the anterior inferior Spine of the Os Ilium, from whence it runs obliquely downward, joins the Iliacus and is inſerted below the little Trochanter. It repreſents in ſome meaſure a Roman V with the Pectineus, and might be reckoned an Iliacus Minor, if the large Muſcle had not ſometimes an Inſertion in the ſide of the Eminence called Ilio-Pectinea.

372. The Iliacus and Pſoas thus united paſs under the Ligamentum Falloppii, over the Slope or Channel between the anterior inferior Spine of the Os Ilium and Eminentia Ilio-Pectinea, in a ſort of Ligamentary Capſula very ſmooth and poliſhed, that part of it which covers the Channel appearing like a Cartilage.

## §. 3. *Pectineus.*

*Situation in general.* 373. This is a ſmall flat and pretty long Muſcle, broad at the upper part and narrow at the lower, ſituated obliquely between the Os Pubis and upper part of the Os Femoris. It is commonly a ſingle Muſcle; but I have ſometimes found it double.

*Inſertions.* 374. It is fixed above by fleſhy Fibres to all the ſharp Ridge or Criſta of the Os Pubis, and to a ſmall part of the oblong Notch or Depreſſion on the foreſide of that Criſta, in which the upper Extremity of this Muſcle is lodged.

375. From thence it runs down obliquely towards the little Trochanter, under and a little behind which it is inſerted obliquely by a flat Tendon, between the ſuperior Inſertion of the Vaſtus Internus and inferior Inſertion of the Triceps Secundus with which it is united.

## §. 4. *Glutæus Maximus.*

*Situation in general.* 376. This is a thick broad Muſcle, reſembling the Quadrant of a Circle in Figure, lying on the outſide of the Os Ilium and upper part of the Os Femoris.

*Inſertions.* 377. It is fixed wholly fleſhy to all the lateral Poſterior parts of the Os Coccygis and Os Sacrum; to the Ligamentum Sacro-Sciatium; to the outſide of the Tuberoſity of the Os Ilium; and from thence to the external Labium of the Criſta of that Bone all the way to it's higheſt part where this Muſcle mixes Fibres with the Glutæus Medius.

378. It is likewiſe fixed to the inſide of the Faſcia Lata at the places, which anſwer to all the Inſertions already mentioned, but through a much greater Space, and by a very great number of fleſhy Fibres, almoſt in the ſame manner as we ſhall ſee in the external Plane of the Muſculus Temporalis. The Fibres which end in this Faſcia become gradually ſhorter, as they are ſituated lower.

379. All theſe Fibres contract in breadth in a Radiated manner as they approach to the great Trochanter, and afterwards form a ſtrong, flat, pretty broad Tendon, about an Inch in length, which is inſerted a Finger's breadth or a little more below the great Trochanter, in all that large Longitudinal Impreſſion at the upper part of the Linea Aſpera on the backſide of the Os Femoris, between the Vaſtus Externus and largeſt Portion of the Triceps.

380. This Tendon is covered and ſtrengthened by a production of the Faſcia Lata, in which ſeveral fleſhy Fibres of this Muſcle are inſerted at that place. It is a very ſtrong Tendon, and in this and other reſpects bears ſome reſemblance to that of the Deltoides.

*Connexion.* 381. This Muſcle covers part of the Glutæus Medius; and at it's Inſertion in the Os Coccygis, it almoſt joins that of the Glutæus Maximus of the other ſide.

§. 5. *Glutæus*

## §. 5. *Glutæus Medius.*

382. This is a radiated Muſcle almoſt in the Shape of a ſpread Fan. It is pretty thick, and almoſt as broad as the whole outſide of the Os Ilium, being ſituated between the Criſta of that Bone and the great Trochanter, and covered Anteriorly by the Faſcia Lata, and Poſteriorly by the Glutæus Maximus. *Situation in general.*

383. It is fixed above by fleſhy Fibres to all that Space on the outſide of the Os Ilium, which lies between the external Labium of the Criſta, and the ſemicircular Impreſſion which goes between the Superior Anterior Spine, and the great Poſterior Sinus.

384. It is likewiſe fixed in the Edge of that Ligament which goes between the lower part of the Os Sacrum and Os Ilium. Laſtly, the inner part of it which is covered only by the Faſcia Lata is inſerted in the inſide of that Faſcia in the ſame manner as the Glutæus Maximus.

385. From thence all the Fibres contract in breadth, more or leſs in a radiated manner, as they advance toward the great Trochanter, and form a ſhort thick Tendon which mixes a little anteriorly with the Tendon of the Glutæus Minimus; and the moſt Poſterior Fibres gradually join the ſide of the Tendon of the Pyriformis.

386. The Tendon is inſerted in the upper Convex part of the great Trochanter, from the Apex of the large ſuperior external rough Surface, all the way to the anterior rough Surface, encompaſſing in a manner all that part of the Trochanter.

387. This is the broadeſt of all the Glutæi. The Diſpoſition of it's Fibres is not every where uniform; the anterior Series ſeeming to make a diſtinct Portion, not by being ſeparated from the reſt, but by being differently directed, for they deſcend almoſt parallel to each other; whereas the middle and poſterior Portions are in a more Radiated Diſpoſition; and the anterior Portion is likewiſe more fleſhy and thick than the other two. *Connexion.*

338. When this Muſcle is inverted upward, it's Tendon being firſt cut off from it's Inſertion, we ſee a kind of Tendinous Arch running along it's whole Inſertion in the ſemicircular Line.

## §. 6. *Glutæus Minimus.*

389. This is a ſmall, broad, radiated Muſcle ſituated on the outſide of the Os Ilium, under the other two Glutæi. *Situation in general.*

390. It is fixed above in all that Portion of the outſide of the Os Ilium, which lies between the great ſemicircular Line, and another ſmall one a little above the Supercilium of the Cotyloide Cavity or Acetabulum, running between the Anterior Inferior Spine and the great Poſterior Sinus. It is likewiſe fixed in the Edge of that Sinus, in the Spine of the Iſchium and in the Orbicular Ligament of the Joint of the Hip. *Inſertions.*

391. From thence it's Fibres contracting in breadth, form a ſhort Tendon, by which the Muſcle is inſerted in the anterior part of the upper Edge of the great Trochanter, above the great external convex rough Surface in which the Glutæus Medius is fixed; and alſo in an oblique Surface which runs down a little way between that laſt named and the rough anterior Surface.

392. The Tendon is increaſed in breadth in it's oblique courſe downward, and is likewiſe inſerted in the Orbicular Ligament chiefly by two particular Tendinous Productions or Expanſions,

### §. 7. *Triceps Primus.*

*Situation in general.* 593. This with the two following Tricipital Muſcles, are fleſhy and flat and of different lengths, ſituated between the Os Pubis and the whole length of the Os Femoris. The firſt and ſecond croſs each other in ſuch a manner, as that the Muſcle which is the firſt on the Os Pubis becomes the ſecond on the Os Femoris, and the ſecond on the Os Pubis is the firſt on the Os Femoris. The third Muſcle keeps it's rank.

*Inſertions.* 394. The Triceps Primus is fixed above by a ſhort Tendon to the Tuberoſity or Spine of the Os Pubis, and to the neighbouring part of the Symphyſis, it's Fibres mixing a little with thoſe of the Pectineus. From thence it runs down, increaſing in breadth, and is inſerted by fleſhy Fibres interiorly in the middle Portion of the Linea Femoris Aſpera.

395. At the lower part of this Inſertion, a Portion of the Muſcle ſeparates from the reſt and ſends off a long Tendon, which together with a like Tendon from the Triceps Tertius, is inſerted in the inner Condyle of the Extremity of the Os Femoris.

### §. 8. *Triceps Secundus.*

*Situation in general.* 396. This Muſcle is fixed above by fleſhy Fibres, below the ſuperior Inſertion of the Triceps Primus, in all the outſide of the inferior Ramus of the Os Pubis, as low as the Foramen Ovale, but ſeldom ſo low as the Ramus of the Os Iſchium. This Inſertion is broader than that of the former Muſcle.

*Inſertions.* 397. From thence it runs down and is inſerted in the upper part of the Linea Aſpera, between the Pectineus and Triceps Primus, mixing a little with each of theſe Muſcles. This Inſertion appears ſometimes divided.

### §. 9. *Triceps Tertius.*

*Situation in general.* 398. This Muſcle is fixed above by fleſhy Fibres to the anterior part of all the ſhort Ramus of the Iſchium, and to a ſmall part of the Tuberoſity of that Bone. This Inſertion covers ſome part of the Tendon of the Semi-Membranoſus, and is covered by that of the Semi-Nervoſus.

399. From thence it runs down and is inſerted by fleſhy Fibres in the Linea Aſpera almoſt from the little Trochanter down to the middle of the Os Femoris. It goes lower down than the firſt Triceps, ſending off a ſeparate Portion like that of the Muſcle laſt mentioned.

400. These two Portions join together and form a common Tendon, which running down to the lower Extremity of the Os Femoris is inſerted in the back part of the Tuberoſity of the inner Condyle. This ſeparate Portion is ſometimes large enough to be taken for a diſtinct Muſcle, in which caſe we have a Quadriceps inſtead of a Triceps.

401. In all this progreſs this Muſcle is joined to the Vaſtus Internus by a perforated Aponeuroſis, through which the Blood-Veſſels paſs.

### §. 10. *Pyriformis ſive Pyramidalis.*

402. This is a ſmall oblong Muſcle of the Figure of a flat Pear or Pyramid, from whence it has it's name. It is ſituated almoſt tranſverſely between the Os Sacrum and Iſchium, being covered and hid by the firſt two Glutæi. *Situation in general.*

403. It is fixed to the inferior lateral part of the Os Sacrum, by fleſhy Fibres, and to the neighbouring part of the Anterior or Concave ſide of that Bone, by three Digitations lying between the Anterior Holes. It is likewiſe fixed by a ſmall Inſertion to the Ligamentum Sacro-Sciaticum and Edge of the great Sinus of the Os Ilium. *Inſertions.*

404. From thence it runs tranſverſely toward the Joint of the Hip, it's Fibres contracting in breadth, and ends in a ſmall Tendon which is inſerted in the middle of the internal Labium of the upper Edge of the great Trochanter, by two or three Branches. The upper part of this Tendon receives ſeveral Fibres from the Glutæus Medius, and it's lower part is united to the Gemellus Superior, and Tendon of the Obturator Internus.

405. Sometimes there are two Pyriformes ſeparated by the Nervus Sciaticus.

### §. 11. *Obturator Internus.*

406. This is a flat Muſcle almoſt Triangular, ſituated in the bottom of the Pelvis. It covers the Foramen Ovale, and almoſt all the inſide of the Os Pubis and Iſchium. It has it's name from a Latin Verb which ſignifies to fill up, cover or ſtop. *Situation in general.*

407. It is fixed to the internal Labium of all the Anterior half of the Foramen Ovale, a little to the neighbouring part of the Obturator Ligament; and alſo both above and below the Foramen. It is likewiſe fixed to the upper half of the inſide of the Os Iſchium from the upper oblique Notch in the Foramen Ovale, to the ſuperior part of the great Poſterior Sinus of the Os Ilium, which would be more properly named Sinus Iliacus than Sinus Iſchiadicus. *Inſertions.*

408. From all this Extent the fleſhy Fibres contracting in breadth run down below the Spine of the Iſchium, where they go out of the Pelvis through the Poſterior Notch of the Iſchium. The inſide of the Body of this Muſcle, or that turned to the Cavity of the Pelvis, is pretty uniform; but the outſide, or that turned toward the Foramen Ovale and which touches the Bone, has four middle radiated Tendons, which uniting at the Poſterior Notch of the Iſchium, run over it from behind forward, as over a Pulley, each Tendon ſliding in a particular Cartilaginous Channel deſcribed in the Treatiſe of the Skeleton.

409. Afterwards the four Tendons having got out of the Pelvis are very ſtrictly united in one large flat Tendon, which croſſing that of the Pyriformis, unites with it, having firſt received on each ſide ſome additional fleſhy Fibres from the two Gemelli.

410. The great Tendon ſlides freely in a ſort of Membranous Vagina formed by theſe Muſcles, as ſhall be obſerved hereafter, and is inſerted in the middle of the ſuperior part of the Cavity of the great Trochanter, adhering cloſely to the Capſular Ligament of the Joint, and being united to the Tendons of the Glutæus Minimus and Pyriformis.

## §. 12. *Gemelli.*

*Situation in general.*

411. These are two ſmall, flat, narrow Muſcles, ſituated almoſt Tranſverſely one above the other, between the Tuberoſity of the Iſchium and the great Trochanter, immediately below the Pyriformis, and parted by the Tendon of the Obturator Internus.

412. The ſuperior and ſmalleſt Gemellus is fixed to the lower part of the Spine of the Iſchium, to the ſuperior part of the ſmall Iſchiatick Notch, and to a rough Line which runs croſs the outſide of the Iſchium beginning from the Spine, and continued under the Acetabulum, where it is bent downward.

413. The inferior and largeſt Gemellus is fixed to the ſuperior and back part of the Tuberoſity of the Iſchium, and to a rough Impreſſion which runs croſs the outſide of the Iſchium from the lower Extremity of the Iſchiatic Notch, and is bent upward toward the other Line, together with which it forms a ſort of irregular Semi-Circle.

414. Both theſe Muſcles have likewiſe a ſmall Inſertion in the inſide of the Iſchium, where being united together by a particular Membrane, one of them joins the upper ſide, and the other the lower ſide of the Obturator Internus, a little after it has paſſed over the Notch: they incloſe it as in a Bag, and continue to be fixed to it by fleſhy Fibres all the way to it's Extremity.

415. The ſuperior Muſcle terminates wholly with the Tendon of the Obturator Internus, but the inferior being broader, is inſerted likewiſe by fleſhy Fibres in the Orbicular Ligament, and under the Tendon of the ſame Obturator.

## §. 13. *Obturator Externus.*

416. This is a ſmall flat Muſcle which fills up the Foramen Ovale of the Os Innominatum exteriorly, and reaches from thence to the great Trochanter of the Os Femoris, behind the Neck of that Bone. *Situation in general.*

417. It is fixed by fleſhy Fibres to the outer or anterior ſide of the Os Pubis, all the way to the Foramen Ovale, to the Edge of that Hole, next the ſmall Ramus of the Iſchium, and a little to the neighbouring parts of the Obturator Ligament. *Inſertions.*

418. From thence it's Fibres contracting in breadth, paſs on that foreſide of the great Ramus of the Iſchium, under the Acetabulum, where a Tendon is formed, which continues it's courſe behind the Neck of the Os Femoris toward the great Trochanter, and is inſerted between the Gemelli and Quadratus, in a ſmall Foſſula between the Apex of the great Trochanter and the Baſis of the Collum Femoris.

## §. 14. *Quadratus.*

419. This is a ſmall, flat, fleſhy Muſcle, of the Figure of an oblong Square, from whence it has it's Name. It is ſituated tranſverſely between the Tuberoſity of the Iſchium and the great Trochanter. *Situation in general.*

420. It is fixed by one Extremity along that obtuſe Line which runs from under the Acetabulum, toward the lower part of the Tuberoſity of the Iſchium. From thence it runs directly toward the great Trochanter, and is inſerted in almoſt all the lower half of the oblong Eminence in that Apophyſis; but chiefly in the ſmall riſing or Tuberoſity in the middle of that Eminence. *Inſertions.*

## §. 15. *Muſculus Faſciæ Latæ.*

421. This is a ſmall and pretty long Muſcle, ſituated a little obliquely upward and downward on the forepart of the Hip. *Situation in general.*

422. It is fixed above to the outſide of the anterior ſuperior Spine of the Os Ilium, between the Inſertions of the Glutæus Medius and Sertorius. From thence it's fleſhy Fibres run down a little obliquely backward, forming a very flat Body, four Fingers breadth in length, and two in breadth. *Inſertions.*

423. This Body lies between two Laminæ of the Faſcia Lata, and is inſerted therein by ſhort Tendinous Fibres, which diſappear at that place where the Faſcia adheres to the great Trochanter and Tendon of the Glutæus Maximus. We ought by no means therefore to look upon the Faſcia as a Tendinous Expanſion of this Muſcle.

## ART. XI.

### *The Muſcles which move the Bones of the Leg on the Os Femoris.*

424. TEN Muſcles are commonly reckoned to belong to this Article. Moſt of them are very long, and ſituated lengthwiſe near each other, quite round the Os Femoris.

1. *Rectus Anterior ſive Gracilis Anterior.*
2. *Vaſtus Externus.*
3. *Vaſtus Internus.*
4. *Crureus.*
5. *Sartorius.*
6. *Gracilis Internus ſive Rectus Internus.*
7. *Biceps.*
8. *Semi-Nervoſus.*
9. *Semi-Membranoſus.*
10. *Popliteus.*

425. OF theſe ten Muſcles, the Popliteus only is ſmall, and lies as it were out of the rank of the reſt, being ſituated below the Thigh. One Portion of the Biceps is likewiſe ſmall.

426. THESE Muſcles not only move the Leg upon the Thigh, but alſo the Thigh upon the Leg, the Popliteus excepted. Some of them likewiſe move the Thigh upon the Pelvis, and the Pelvis upon the Thigh, viz. The Gracilis Anterior, Sartorius, Gracilis Interior, the great Portion of the Biceps, Semi-Nervoſus, and Semi-Membranoſus.

427. THESE are not the only Muſcles which move the Leg upon the Thigh and the Thigh upon the Leg. The Gaſtroecnemii may likewiſe perform theſe Motions, though commonly confined to the Extenſion of the Foot.

### §. 1. *Rectus Anterior ſive Gracilis Anterior.*

*Situation in general.* 428. This Muſcle is as long as the Os Femoris, and lies directly along the foreſide of the Thigh, from whence it has the name of Rectus Anterior. The greateſt part of it is fleſhy, and the middle is broader than the two Extremities. It is called Gracilis, from it's thinneſs or flatneſs.

*Inſertions.* 429. IT terminates above, by a pretty ſtrong Tendon which is divided into two Branches, one ſhort and ſtrait, the other long and bent. The ſhort Branch running up in a ſtrait Line, is inſerted in the anterior inferior Spine of the Os Ilium.

430. THE long Branch is inflected backward over the Supercilium of the Acetabulum, and runs in the Direction thereof from the Spine toward the great Iſchiatick Sinus. It is ſtrong and flat, adhering very cloſely to the Bone and covered by the Orbicular Ligament and the Glutæus Minimus;

and therefore they who follow the common method, in diſſecting, often cut it off, and obſerve only the ſmall Branch of the Tendon.

431. From thence the Muſcle runs down wholly fleſhy, and partly Penniform, ſome of it's Fibres meeting above and ſeparating below. It is narrower at the upper Extremity, and grows gradually broader toward the middle. Afterwards it contracts again in the ſame manner, and at the lower Extremity of the Os Femoris ends in a flat broad Tendon.

432. Through it's whole courſe it lies between the two Vaſti and covers the Crureus; and it's inferior Tendon is inſerted in the upper Edge of the Patella, from whence it ſends down a ſmall Plane of Tendinous Fibres which adhere very cloſely to the Convex ſide of that Bone, and having reached the great Ligament, ſeem to be loſt therein.

### §. 2. *Vaſtus Externus.*

433. This is a very large fleſhy Muſcle, almoſt as long as the Os Femoris, broad at the Extremities and thick in the middle, lying on the outſide of the Thigh. *Situation in general.*

434. It's upper Inſertion being ſomething Tendinous, is in the Poſterior or Convex rough Surface of the Trochanter. It is likewiſe fixed by a fleſhy Inſertion along the outſide of the Os Femoris for above two thirds of it's length downward, in the correſponding part of the Linea Aſpera, and in the neighbouring Portion of the Faſcia Lata. *Inſertions.*

435. From all this Extent the fleſhy Fibres running downward, and a little obliquely forward toward the Rectus Anterior, terminate inſenſibly in a kind of ſhort Aponeuroſis, which is fixed in all the neareſt Edge of the Tendon of the Rectus, in the ſide of the Patella, in the Edge of the Ligament of that Bone, and in the neighbouring lateral part of the Head of the Tibia.

436. The Body or Belly of this Muſcle grows bigger gradually from it's upper Extremity to the middle, and from thence diminiſhes again by degrees. It's loweſt Fibres run in a little behind the Rectus and are inſerted there.

### §. 3. *Vaſtus Internus.*

437. This Muſcle is very like the former, and ſituated in the ſame manner on the inſide of the Os Femoris. *Situation in general.*

438. It is fixed above by a ſhort flat Tendon, in the anterior rough Surface of the great Trochanter, and by fleſhy Fibres in that oblique Line which terminates the Baſis of the Collum Femoris anteriorly, on the foreſide of the Inſertions of the Pſoas and Iliacus; in the whole inſide of the Os Femoris, and in the Linea Aſpera on one ſide of the Inſertions of the three Tricipites, almoſt down to the internal Condyle. *Inſertions.*

439. From all this Extent the Fibres run downward, and a little obliquely forward, and the Body of the Muſcle increaſes in the ſame manner

as the Vaſtus Internus. It terminates below in an Aponeuroſis, which is fixed in the Edge of the Tendon of the Rectus Anterior, in the ſide of the Patella, and of it's Tendinous Ligament, and in the ſide of the Head or upper Extremity of the Tibia.

## §. 4. *Crureus.*

*Situation in general.*

440. This is a fleſhy Maſs, covering almoſt all the foreſide of the Os Femoris between the two Vaſti, which likewiſe cover the Edges of this Muſcle on each ſide.

*Inſertions.*

441. It is fixed to the foreſide of the Os Femoris, from the Anterior Surface of the great Trochanter down to the loweſt Quarter of the Bone, by fleſhy Fibres which run down ſucceſſively over each other, between the two Vaſti, and are partly united to theſe two Muſcles, ſo as not to ſeem to form a diſtinct Muſcle.

442. It is not ſo thick as the two Vaſti; and as it is covered by them on each ſide, a ſort of fleſhy Channel is formed by all the three, in which the Rectus is lodged, covering the forepart of the Crureus.

443. It terminates below in a Tendinous Aponeuroſis which joins the backſide of the Tendon of the Rectus Anterior, and the neighbouring Edges of the Extremities of the two Vaſti. Thus theſe four Muſcles form a common Tendon, which is inſerted in the places already mentioned.

## §. 5. *Sartorius.*

*Situation in general.*

444. This is the longeſt Muſcle of the Human Body. It is flat, and about two Fingers in breadth, ſituated obliquely along the inſide of the Thigh. It is called Sartorius for a reaſon which ſhall be given in deſcribing it's uſes.

*Inſertions.*

445. It is fixed above by a very ſhort Tendon, in the lower part of the anterior ſuperior Spine of the Os Ilium, before the Muſculus Faſciæ Latæ. The beginning of it's Body lies in the Notch between the two Anterior Spines of that Bone.

446. From thence it runs down obliquely over the Vaſtus Internus and other Muſcles that lie near it, all the way to the inſide of the Knee, where it terminates in a ſmall Tendon which grows broader near it's Extremity, and is inſerted obliquely and a little tranſverſely, in the forepart of the inſide of the Head of the Tibia, near the Spine or Tuberoſity of that Bone, immediately above the Inſertion of the Gracilis Interior.

447. The fleſhy Body of this Muſcle is incloſed in a Vagina formed by an Expanſion of the Faſcia Lata. It's Fibres in general are Longitudinal, and where it's lower Tendon turns obliquely round toward the Head of the Tibia, it ſeems to be braced down and ſecured in it's place, by a Tendinous Frænum or Vagina. A little before it is inſerted, it detaches a diſtinct Aponeuroſis or Tendinous Branch, which runs obliquely downward on the inſide of the Tibia.

### §. 6. *Gracilis Interior ſive Rectus Interior.*

*Situation in general.*

448. This is a long thin Muſcle lying in a ſtrait Line on the inſide of the Thigh, between the Os Pubis and the Knee; and from this Situation and Structure it's names are taken.

*Inſertions.*

449. It is fixed in the Edge of the Inferior Branch of the Os Pubis near the Symphyſis, by a broad and very ſhort Tendon, on one ſide of the Inſertion of the Triceps Secundus, but a little lower down.

450. From thence the fleſhy Fibres contracting a little in breadth, run down to the internal Condyle of the Os Femoris, where they terminate in a thin Tendon, which afterwards degenerates into a kind of Aponeuroſis, and is inſerted in the forepart of the inſide of the Head of the Tibia.

451. This Tendon is inſerted immediately below the Sartorius, by which it is partly covered, and above the Semi-Tendinoſus which it partly covers, mixing ſome Fibres with it. Before it ends, it makes the ſame oblique Turn, and is braced down in the ſame manner as the Tendon of the Sartorius, and it ſends the ſame kind of Aponeuroſis obliquely downward, on the inſide of the Tibia.

### §. 7. *Biceps.*

*Situation in general.*

452. This Muſcle is made up of two Portions, one long, the other ſhort, and they end in a common Tendon. Both Portions are fleſhy and conſiderably thick, being ſituated on the back and outſide of the Thigh between the Buttock and Ham.

453. The great Portion is fixed above by a ſtrong Tendon in the poſterior and lower part of the Tuberoſity of the Iſchium under the Inſertion of the inferior Gemellus, and cloſe behind that of the Semi-Nervoſus. From thence it runs down toward the lower Extremity of the Thigh, where it meets the other Portion, and joins with it in forming a common Tendon.

454. The ſmall Portion is fixed by fleſhy Fibres to the outſide of the Linea Aſpera below it's middle, and to the Faſcia Lata where it forms a Septum between the Triceps and Vaſtus Externus. From thence the Fibres run down a little way, and then meeting the great Portion, a common Tendon is formed between them.

455. This ſtrong Tendon runs down to the outer and back part of the Knee, and is inſerted in the lateral Ligament of the Joint and in the Head of the Fibula by two very ſhort Tendinous Branches. It ſometimes ſends off a Tendinous Expanſion, which is often unſkilfully cut off with the Fat.

### §. 8. *Semi-Nervoſus.*

*Situation in general.*

456. This is a long Muſcle, half fleſhy and half Tendinous, or like a Nerve, from whence it has it's name. It is ſituated a little obliquely on the poſterior and inner part of the Thigh.

*Inſertions.* 457. It is fixed above to the poſterior part of the Tuberoſity of the Iſchium, immediately before and a little more inward than the Biceps. It is afterwards fixed by fleſhy Fibres to the Tendon of the Biceps for about the breadth of three Fingers much in the ſame manner as the Coraco-Brachialis is fixed to the Biceps of the Arm.

458. From thence it runs down fleſhy toward the lower part of the inſide of the Thigh, having a ſort of Tendinous Interſection in the inner part of it's fleſhy Portion. Having reached below the middle of the Thigh, it terminates in a ſmall, long, round Tendon, which runs down to the inſide of the Knee behind that of the Gracilis, where it expands in breadth.

459. It is inſerted in the inſide of the upper part of the Tibia about two or three Fingers breadth below the Tuberoſity or Spine, immediately under the Tendon of the Gracilis Internus with which it communicates. It has the ſame oblique Turn with the Gracilis and Sartorius, and ſends off a like kind of Aponeuroſis.

### §. 9. *Semi-Membranoſus.*

*Situation in general.* 460. This is a long, thin Muſcle partly Tendinous, from whence it has it's name, and ſituated on the backſide of the Thigh a little towards the inſide.

*Inſertions.* 461. It is fixed above by a broad Tendon or long Aponeuroſis in the irregular, obtuſe prominent Line which goes from the Acetabulum to the Tuberoſity of the Iſchium, a little above the Inſertion of the Semi-Nervoſus, and between thoſe of the Gemellus Inferior and Quadratus, mixing ſome Fibres with the Triceps Tertius.

462. From thence it runs down fleſhy in an oblique Direction behind the inner Condyle of the Os Femoris, below which it terminates in a thick Tendon, which is inſerted in the poſterior and interior ſide of the inner Condyle of the Tibia, by three ſhort Branches, the firſt or uppermoſt of which goes a little toward the inſide, the ſecond, more backward, and the third, lower down. Before it is inſerted, it ſends off ſometimes an Aponeuroſis like that of the Biceps.

### §. 10. *Popliteus.*

*Situation in general.* 463. This is a ſmall Muſcle obliquely Pyramidal, ſituated under the Ham, from whence it has it's name.

*Inſertions.* 464. It is fixed above by a ſtrong narrow Tendon to the outer Edge of the inner Condyle of the Os Femoris, and to the neighbouring Poſterior Ligament of the joint. From thence it runs obliquely downward under the inner Condyle of the Os Femoris; it's flat and pretty thick fleſhy Body increaſing gradually in breadth, till it is fixed in the backſide of the Head of the Tibia all the way to the oblique Line or Impreſſion obſervable on that ſide.

## ART. XII.

### *The Muſcles which move the Tarſus on the Leg.*

465. THE Motions of the Tarſus are ſuppoſed to be performed by nine Muſcles ſituated in the Leg; three on the foreſide and ſix on the backſide, viz.

1. *Tibialis Anticus.*
2. *Peroneæus Medius.*
3. *Peronæus Minimus.*
4, 5. *Gaſtrocnemii.*
6. *Soleus.*
7. *Tibialis Gracilis vulgo Plantaris.*
8. *Tibialis Poſticus.*
9. *Peronæus Maximus.*

466. These Muſcles, three of which are Anterior and ſix Poſterior, not only move the Tarſus on the Leg, but alſo the Leg on the Tarſus, except the Tibialis Gracilis or Plantaris. Theſe Motions may likewiſe be performed by four Muſcles which belong to the Toes, the names of which are theſe:

10. *Extenſor Pollicis Longus.*
11. *Extenſor Digitorum Longus.*
12. *Flexor Pollicis Longus.*
13. *Flexor Digitorum Longus.*

### §. 1. *Tibialis Anticus.*

*Situation in general.*

467. This is a long Muſcle fleſhy at the upper part and Tendinous at the lower, ſituated on the foreſide of the Leg between the Tibia and the Extenſor Digitorum Longus.

*Inſertions.*

468. It is fixed above by fleſhy Fibres in the upper third part of the external Labium of the Criſta Tibiæ, and of the inſide of the Aponeuroſis Tibialis, or of that Ligamentary Expanſion which goes between the Criſta Tibiæ and the Anterior Angle of the Fibula. It is likewiſe fixed obliquely in the upper two thirds of the outſide of the Tibia or that next the Fibula.

469. From thence it runs down and ends in a Tendon which firſt paſſes through a Ring of the common Annular Ligament, and then through another ſeparate Ring ſituated lower down. Afterwards the Tendon is fixed partly in the upper and inner part of the Os Cuboides, and partly in the inſide of the firſt Bone of the Metatarſus.

### §. 2. *Peronæus Medius vulgo Peronæus Anticus.*

*Situation in general.*

470. This is a long Muſcle, ſituated anteriorly on the middle part of the Fibula.

*Inſertions.* 471. It is fixed above by fleſhy Fibres, to more than the middle third part of the anterior or outſide of the Fibula, and to the neighbouring part of the Aponeuroſis Tibialis.

472. It is likewiſe fixed to a Production from the inſide of that Aponeuroſis which runs to the upper part of the Tibia, and there ſerves for a middle Septum between this Muſcle and the Extenſor Digitorum Longus.

573. From thence it runs down and forms a Tendon, which going in the Direction of the oblique Line on the Fibula, paſſes behind the External Malleolus, and then through an Annular Ligament common to it and to the Peronæus Maximus, and is afterwards inſerted in the Tuberoſity at the Baſis of the fifth Metatarſal Bone, ſending off a ſmall Tendon to the firſt Phalanx of the little Toe.

### §. 3. *Peronæus Minimus.*

*Situation in general.* 374. This is a ſmall Muſcle, commonly thought to be a Portion of the Extenſor Digitorum Longus, though it is eaſily ſeparable from it.

*Inſertions.* 475. It is fixed by fleſhy Fibres in the lower half of the inſide of the Fibula, between two oblique bony Lines, on one ſide of the lower part of the Extenſor Digitorum Longus, to which Muſcle it is ſimply contiguous.

476. From thence it runs down, contracting in breadth, and paſſes with the Extenſor Longus through the common Annular Ligament forming a flat Tendon, which ſoon ſeparates from thoſe of the Extenſor, and is inſerted near the Baſis of the fifth Metatarſal Bone.

477. It is diſtinguiſhed from the other two Peronæi by a Septum or Production of the Ligamentary Aponeuroſis of the Tibia.

### §. 4. *Gaſtrocnemii.*

*Situation in general.* 478. These are two thick, pretty broad and oblong Muſcles, ſituated laterally with reſpect to each other, in the ſame Plane, under the Poples, and forming a great part of what is called the Calf of the Leg. That which lies next the Tibia is called Internus, and that next the Fibula, Externus; and becauſe they form, as it were, the Belly of the Leg, they have been termed in Greek, Gaſtrocnemii.

*Inſertions.* 479. Each Muſcle is fixed above by a flat Tendon, to the Poſterior part of the lower Extremity of the Os Femoris, behind the lateral Tuberoſity of each Condyle, adhering cloſely to the Poſterior Ligaments of the Joint of the Knee.

480. From thence they run down, each forming a large and pretty broad fleſhy Body, irregularly Oval. The Externus covers the Popliteus, being larger and broader, ſpreading more laterally, and running lower down than the Internus, the fleſhy Body of which begins higher up than the other.

481. About the middle of the Leg they end in a ſtrong, broad, common Tendon, which contracts a little in breadth as it deſcends, and is inſerted in the Poſterior Extremity of the Os Calcis, together with the Tendon of the Soleus.

482. The ſuperior Tendons of theſe Muſcles become gradually Cartilaginous in aged Perſons, and at laſt oſſify near the Condyles; the bony Portions looking like Seſamoide Bones. It is ſometimes very late before they are hardened in this manner, and ſometimes one grows hard before the other.

### §. 5. *Soleus.*

583. This is a large, fleſhy, flat Muſcle, nearly of an oval Figure, and thicker in the Middle than at the Edges. It has it's name from it's ſuppoſed likeneſs to a Sole. It is ſituated on the backſide of the Leg, lower down than the Gaſtrocnemii by which it is covered, and theſe three Muſcles form the Calf of the Leg. *Situation in general.*

484. It is fixed above, partly to the Tibia and partly to the Fibula, It is fixed to above one third of the upper part of the backſide of the Fibula, and a little to the Articular Ligament of the Head of this Bone. It is likewiſe fixed to the backſide of the Tibia from the oblique Line or Impreſſion which terminates the Inſertion of the Popliteus, down to the middle of the internal Angle of the Bone. *Inſertions.*

485. Afterwards leaving theſe two Bones it ends in a broad ſtrong Tendon, which together with that of the Gaſtrocnemii, forms what is called Tendo Achillis. This ſtrong Tendon contracts a little, in it's paſſage to the Os Calcis, and then expanding a little, it is inſerted obliquely in the backſide of that Bone all the way to the Tuberoſity. The outer or Poſterior Fibres of this large Tendon are the longeſt, the inner or anterior Fibres ſhorteſt, and the reſt are longer or ſhorter in proportion to their nearneſs to theſe two Portions.

486. The fleſhy Body of the Soleus ſeems to conſiſt of two Planes of Fibres at leaſt, that on the backſide of the Muſcle being the moſt ſimple; and the other, or that next the Bone, being Penniform.

487. This Muſcle and the two Gaſtrocnemii form what Anatomiſts call a true Triceps.

### §. 6. *Tibialis Gracilis vulgo Plantaris.*

488. This is a ſmall Pyriform Muſcle, ſituated obliquely in the Ham below the external Condyle of the Os Femoris, between the Popliteus and Gaſtrocnemius Externus; and it's Tendon which is long, flat and very ſmall, runs down on the ſide of the Gaſtrocnemius Internus all the way to the Heel. *Situation in general.*

489. The fleſhy Body which is only about two Inches in length and one in breadth, is fixed by a ſhort flat Tendon above the outer Edge of the exterior Condyle of the Os Femoris, on one ſide of the Gaſtrocnemius Externus. From thence the fleſhy Body runs obliquely over the Edge of the Popliteus, and terminates in a very ſmall, long, flat Tendon. *Inſertions.*

490. This Tendon runs between the Body of the Gaſtrocnemius Externus and Soleus, all the way to the inner Edge of the upper part of the

Tendo Achillis; and from thence continuing it's courſe downward, it joins this Tendon and is inſerted together with it, in the outſide of the poſterior part of the Os Calcis, without communicating with the Aponeuroſis Plantaris.

491. Sometimes this Muſcle is wanting, and ſometimes it is ſituated lower down.

### §. 7. *Tibialis Poſticus.*

*Situation in general.*

492. This is a long fleſhy Penniform Muſcle, broader above than below, ſituated between the Tibia and Fibula on the backſide of the Leg and covered by the Extenſor Digitorum Longus.

*Inſertions.*

493. It is fixed above by fleſhy Fibres, immediately under the Articulation of the Tibia and Fibula, to the neareſt parts of theſe two Bones, chiefly to the Tibia, reaching to the lateral parts of that Bone, above the Interoſſeous Ligament which is here wanting.

494. From thence it's Inſertion is extended below the oblique Line or Impreſſion in the Tibia, over all the neighbouring part of the Interoſſeous Ligament, and through more than the upper half of the internal Angle of the Fibula.

495. Through all this Space it is fleſhy, penniform and covered by the Extenſor Digitorum Longus, which ſometimes communicates with it by a middle Tendon, and ſends off an Aponeuroſis to it, which does the office of a Frænum.

496. After this, it forms a Tendon which runs down behind the inner Malleolus, through a Cartilaginous Groove and an Annular Ligament, and paſſing under the Malleolus, is inſerted in the Tuberoſity or lower part of the Os Scaphoides. This Tendon is ſometimes divided into two, one of which croſſing a little over that of the Peronæus Longus is fixed in the Os Cuboides.

### §. 8. *Peronæus Maximus vulgo Peronæus Poſterior.*

*Situation in general.*

497. This is a long Penniform Muſcle lying on the Fibula.

*Inſertions.*

498. It is fixed above to the anterior and outer part of the Head of the Fibula, and to a ſmall Portion of the Head of the Tibia; then to the outſide of the Neck of the Fibula, to the upper half of the external Angle of that Bone, and to the Aponeuroſis Tibialis, which at that place makes a Septum between this Muſcle and the Extenſor Pollicis.

499. From thence turning a little backward according to the Direction of the Bone, it forms a conſiderable Tendon, which running down behind the external Malleolus, paſſes through a kind of hollow Groove, and through an Annular Ligament common to it, and to the Tendon of the Peronæus Medius which lies before it. It paſſes likewiſe through an Annular Ligament on the outer and anterior part of the Os Calcis, and under the ſmall lateral Tuberoſity ſometimes found there.

500. Afterwards running through the oblique Groove in the lower ſide of the Os Cuboides, it is inſerted in the ſide of the Baſis of the firſt Metatarſal Bone, and alſo a little in the Baſis of the Os Cuneiforme Majus.

501. The fleſhy Body of this Muſcle cannot always be diſtinguiſhed from that of the Peronæus Medius.

## ART. XIII.

## *The Muſcles which move the Metatarſus and Toes.*

### §. 1. *Extenſor Pollicis Longus.*

502. THIS is a thin ſingle Muſcle lying between the Tibialis Anticus and Extenſor Digitorum Longus, by which it is almoſt hid. *Situation in in general.*

503. It is fixed to the inſide of the Fibula near the Interoſſeous Ligament, from the Neck down to the loweſt Quarter of that Bone; to the Interoſſeous Ligament through the ſame Space, and a little to the lower Extremity of the Tibia next the Fibula. *Inſertions.*

504. There it ends in a conſiderable Tendon, which paſſing through a diſtinct Ring of the common Annular Ligament, and then through a Membranous Vagina, is inſerted in the Baſis of the firſt Phalanx of the Great Toe, and continued from thence up to the ſecond.

### §. 2. *Flexor Pollicis Longus.*

505. This is a pretty long Muſcle ſituated in the poſterior and lower part of the Leg. *Situation in general.*

506. It is fixed in the lower half of the backſide of the Fibula, it's Inſertion reaching almoſt as far as the External Malleolus. The fleſhy Body advances on the inſide of that Bone towards the Tibia, according to the oblique Direction of that ſide, and ends in a large Tendon. *Inſertions.*

507. This Tendon paſſes behind the lower Extremity of the Tibia, toward the inner Ankle, then through a ſmall Notch in the inner and backſide of the Aſtragalus, and through an Annular Ligament or Ligamenatry Vagina continued under the lateral Arch of the Os Calcis.

508. From thence it advances to the great Toe, and paſſing through the Interſtice between the two Seſamoide Bones, in the Ligamentary Vagina of the firſt Phalanx, is inſerted in the lower part of the ſecond. In ſome Subjects, this Vagina is almoſt Cartilaginous.

509. The two Seſamoide Bones are ſtrongly connected together by Ligaments, and alſo to the lower Edge of the firſt Phalanx, in ſuch a manner as to ſlide eaſily on the two inferior Depreſſions or double Pulley of the Head of the firſt Metatarſal Bone. The Ligament by which they are fixed to the firſt Phalanx is very thick, and has the Appearance of a Cartilage as much as the Vagina.

## §. 3. *Thenar.*

*Situation in general.* 510. This Muſcle is made up of ſeveral Portions, and lies on the inner Edge of the Sole of the Foot.

*Inſertions.* 511. It is fixed by three or four fleſhy Faſciculi to the lower and inner part of the Os Calcis, Os Scaphoides and Os Cuneiforme Majus. It is likewiſe fixed a little in the Annular Ligament under the inner Ankle, which belongs to the Tendon of the Flexor Longus.

512. From all theſe different Inſertions the fleſhy Faſciculi approach each other as they advance forward under the firſt Bone of the Metatarſus, and are fixed partly in the internal Seſamoide Bone, and partly in the inſide of the firſt Phalanx near it's Baſis.

513. There is another Faſciculus fixed by one end to the Os Scaphoides and Os Cuneiforme Majus, and by the other to the external Seſamoide Bone, and outſide of the firſt Phalanx of the Great Toe.

## §. 4. *Antithenar.*

*Situation in general.* 514. This is a ſmall compound Muſcle, lying obliquely under the Metatarſal Bones.

*Inſertions.* 515. It is fixed poſteriorly in the lower parts of the ſecond, third and fourth Metatarſal Bones near their Baſes, in the Ligament belonging to the firſt and ſecond of theſe Bones; in the neighbouring Ligaments belonging to the Bones of the Tarſus; and laſtly, in a lateral Aponeuroſis of the Muſcle commonly called Hypothenar.

516. All theſe Portions contracting into a ſmall compaſs, are inſerted in the outſide of the external Seſamoide Bone and of the firſt Phalanx of the Great Toe.

## §. 5. *Extenſor Digitorum Longus.*

*Situation in general.* 517. This is a long Muſcle fleſhy in the upper part, and Tendinous in the lower, lying between the Tibialis Anticus and Peronæus Maximus.

*Inſertions.* 518. It is fixed above by fleſhy Fibres, in the outſide of the Head of the Tibia, and inſide of the Head of the Fibula; in the upper part of the Interoſſeus Ligament, through three fourths of the length of the Fibula; and through the ſame Space, in the Tendinous Septum belonging to the Anterior Angle of that Bone.

519. It ſeems to mix ſome Fibres on each ſide with the two firſt Peronæi and Tibialis Anticus; and it is very cloſely united with the Peronæus Minimus, which has for that reaſon been looked upon as a Portion of this Extenſor.

520. It contracts in breadth a little above the Annular Ligament, and in paſſing through it, is divided into three Tendons, the firſt of which is

afterwards divided into two. Theſe four Tendons are inſerted along the upper or Convex ſide of the four ſmall Toes.

### §. 6. *Extenſor Digitorum Brevis.*

521. This is a ſmall Complex Muſcle lying obliquely on the Convex ſide of the Foot, being likewiſe termed Pedieus. *Situation in general.*

522. It is fixed in the upper and outer ſide of the Anterior Apophyſis of the Aſtragalus, and in the neighbouring part of the upper ſide of that Bone. From thence it runs obliquely from without inwards, under the Tendons of the Peronæus Minimus and Extenſor Digitorum Longus, being divided into four fleſhy Portions which terminate in the ſame number of Tendons. *Inſertions.*

523. The firſt Tendon is inſerted in the upper or Convex part of the firſt Phalanx of the Great Toe. The other three joining with thoſe of the Extenſor Longus are inſerted along the Convex ſides of all the Phalanges of the three following Toes; and when there is a fifth Tendon, which happens very ſeldom, it goes in the ſame manner to the Little Toe.

524. As this Muſcle is ſituated obliquely, it's Tendons and thoſe of the Extenſor Longus croſs each other a little; and after their common Inſertion in the firſt Phalanges of the Toes, thoſe of the ſhort Extenſor run along the two other Phalanges, almoſt on the outſide of the others. All theſe Tendons communicate by Aponeuroſes in the ſame manner as thoſe of the Hand.

### §. 7. *Flexor Digitorum Brevis ſive Perforatus Pedis.*

525. This is the undermoſt of all the common Muſcles of the Toes, being ſituated immediately above the Aponeuroſis Plantaris, which it reſembles ſomething in Figure; and hence we ſee that it has been very improperly termed Sublimis. *Situation in general.*

526. It is fixed by fleſhy Fibres to the anterior and lower part of the great Tuberoſity of the Os Calcis; and to the neighbouring part of the upper ſide of the Aponeuroſis Plantaris. *Inſertions.*

527. From thence it runs forward, being divided into four fleſhy Portions, which terminate in the ſame number of Tendons, ſplit at their Extremities in the ſame manner as thoſe of the Sublimis or Perforatus of the Hand, and inſerted in the ſecond Phalanges of the four ſmall Toes, a little nearer the inſide than in the Hand.

### §. 8. *Flexor Digitorum Longus ſive Perforans Pedis.*

528. This is a long Muſcle, fleſhy above and Tendinous below, lying on the backſide of the Leg between the Tibia and the Flexor Pollicis Longus, covered by the Soleus, and covering the Tibialis Poſticus. *Situation in general.*

*Inſertions.* 529. It is fixed above by fleſhy Fibres to a little more than the middle third part of the backſide of the Tibia near it's external Angle, below the Inſertion of the Soleus; and alſo to a kind of Ligament which runs down from the middle of the Tibia. It afterwards ends in a Tendon which paſſes behind the inner Ankle, on one ſide, and a little behind the Tibialis Poſticus, in a ſeparate Annular Ligament.

530. From thence it runs under the Sole of the Foot ſending off a Detachment, by which it communicates with the Flexor Pollicis Longus. There it is divided into four ſmall flat Tendons, which go to the third Phalanges of the four ſmall Toes in the ſame manner as the Perforans of the Hand.

531. These four Tendons agree likewiſe in this with thoſe of the Hand, that they give Inſertions to the Lumbricales; but they differ from them in this, that before their Separation they are joined laterally by an Auxiliary fleſhy Body, which I name Flexor Digitorum Acceſſorius.

### §. 9. *Flexor Digitorum Acceſſorius.*

*Situation in general.* 532. This is a flat and pretty long fleſhy Maſs, ſituated obliquely under the Sole of the Foot; which from it's Situation and Figure was formerly termed Caro Plantæ Pedis Quadrata.

*Inſertions.* 533. This Muſcle is fixed poſteriorly by one fleſhy Portion, in the lower ſide of the Os Calcis, and in the anterior Tuberoſity on that ſide, and by the other in the neighbouring Ligament which joins this Bone to the Aſtragalus.

534. From thence the two Portions run obliquely to the middle of the Sole of the Foot, and there unite in a flat long and irregularly ſquare Muſcular Maſs which is fixed to the outer Edge of the Faſciculus of Tendons of the Flexor Longus, to which it ſerves as a Frenum at that place.

535. This Muſcle might more properly be named Plantaris, than that which is commonly ſo called, to which I have given the name of Tibialis Gracilis.

### §. 10. *Lumbricales.*

*Situation in general.* 536. These are four ſmall Muſcles, ſituated more or leſs longitudinally under the Sole of the Foot.

*Inſertions.* 537. They are fixed by their fleſhy Extremities to the four Tendons of the Flexor Digitorum Longus near the Inſertion of the Flexor Acceſſorius. The firſt Muſcle is fixed to the inſide of the firſt Tendon; the ſecond, to the Tendinous Fork formed by the two firſt Tendons; the third, to the Tendinous Fork made by the ſecond and third Tendons; and the fourth, in the ſame manner to the third and fourth Tendons, but commonly moſt to the third.

538. From thence theſe four Muſcles run to the Toes, and there terminate in the ſame number of ſmall Tendons which are inſerted in the firſt

Phalanges of the Toes much after the ſame manner as in the Hand. They are termed Lumbricales or Vermiculares, becauſe of the reſemblance they bear to Worms.

## § 11. *Tranſverſalis Digitorum:*

*Situation in general.*

539. This is a ſmall Muſcle which lies tranſverſely under the Baſis of the firſt Phalanges, and which at firſt ſight appears to be a ſimple Muſcular Body fixed by one end to the Great Toe, and by the other to the Little Toe.

*Inſertions.*

540. When this Muſcle is carefully examined, we find that is fixed by a very ſhort common Tendon to the outſide of the Baſis of the firſt Phalanx of the Great Toe, conjointly with the Antithenar; and by three different Portions or Digitations, to the three Interoſſeous Ligaments which connect the Heads of the four Metatarſal Bones next the Great Toe, laterally to each other. Theſe three Portions are very ſlender, and gradually cover each other.

541. This Muſcle might be reckoned a ſecond Antithenar.

## § 12. *Interoſſei.*

*Situation in general.*

542. These are ſeven ſmall Muſcles which fill up the four Interſtices between the Metatarſal Bones, much after the ſame manner as in the Hand. The four largeſt are Superior, the other three, Inferior. The common Diviſion of them into External and Internal is very improper.

*Inſertions.*

543. The firſt of the ſuperior Muſcles is fixed poſteriourly by fleſhy Fibres, in the Ligament which connects the Baſis of the two firſt Metatarſal Bones; in the outſide of the firſt Bone, and in the upper Part of the inſide of the ſecond. It ends in a ſmall Tendon, which is inſerted in the inſide of the firſt Phalanx of the ſecond Toe.

544. The other three are fixed by fleſhy Fibres in the inner and upper parts of the laſt three Metatarſal Bones, and in the outer and upper parts of the ſecond, third and fourth Bones. They likewiſe end in Tendons which are inſerted in the outſides of the firſt Phalanges of the ſecond, third, and fourth Toes.

545. The three inferior Muſcles are fixed proportionably by fleſhy Fibres to the lower parts of theſe Bones, chiefly to the third, fourth and fifth, and to the Ligaments belonging to their Baſes. The firſt inferior Interoſſeus is likewiſe fixed by ſome Fibres to the Tendon of the Peronæus Maximus. The Tendons of theſe three Muſcles are inſerted in the inſides of the Baſes of the firſt Phalanges of the laſt three Toes.

## § 13. *Metatarſius.*

546. This is a fleſhy Maſs lying under the Sole of the Foot. It is fixed by one end, in the forepart of the great Tuberoſity of the Os Calcis; and

running forward from thence, it terminates in a kind of ſhort Tendon which is fixed in the Tuberoſity and poſterior part of the lower ſide of the fifth Bone of the Metatarſus. It may move this Bone much after the ſame manner as the Metacarpius moves the fourth Bone of the Metacarpus.

### § 14. *Parathenar Major.*

*Situation.* 547. This is a pretty long Muſcle forming part of the outer Edge of the Sole of the Foot. It is commonly termed Hypothenar, but very improperly, according to the ſignification of that Word.

*Inſertion.* 548. It is fixed backwards by a fleſhy Body, to the outer part of the lower ſide of the Os Calcis, from the ſmall Poſterior External Tuberoſity all the way to the Anterior Tuberoſity. There, it joins the Metatarſius, and at the Baſis of the fifth Metatarſal Bone, ſeparates from it again, and forms a Tendon which is inſerted in the outſide of the firſt Phalanx of the Little Toe near its Baſis, and near the Inſertion of the Parathenar Minor.

### § 15. *Parathenar Minor.*

549. This is a fleſhy Muſcle fixed along the poſterior half of the outer and lower ſide of the fifth Bone of the Metatarſus. It terminates under the Head of that Bone, in a Tendon which is inſerted in the lower part of the Baſis of the firſt Phalanx of the Little Toe.

550. The Tendinous Inſertion of this Muſcle is very cloſely united to the Cartilaginous Ligament mentioned in the Deſcription of the Freſh Bones. The ſame thing is to be obſerved concerning the other Muſcles which go to the lower Parts of the Baſis of the firſt and ſecond Phalanges of the Toes. In aged Perſons ſome Parts of theſe Ligaments are often turned to Bone, and thereby form theſe bony Portions which are taken for diſtinct Seſamoide Bones, as has been already ſaid.

## ART. XIII.

### *The Muſcles employed in Reſpiration.*

551. I Reduce theſe Muſcles to a ſmaller number than is commonly done, viz.

1. *Diaphragma.*
2. *Scaleni.*
3. *Serrati Poſtici Superiores.*
4. *Serrati Poſtici Inferiores.*
5. *Inter-Coſtales.*
6. *Supra Coſtales.*
7. *Infra-Coſtales.*
8. *Sterno-Coſtales vulgo Triangulares.*

552. The Diaphragm is one Muſcle in a middle Situation in the Body. All the reſt are regularly diſpoſed in Pairs on the two ſides of the Thorax, and ſeveral of them are in great numbers. The Subclavii and Sacro-Lumbares are commonly joined to theſe Muſcles, and ſome Anatomiſts add the Pectorales Minores, and Serrati Majores. I have already ranked the Subclavii, Pectorales Minores, and Serrati Majores among the Muſcles that move the Shoulders; and I place the Sacro-Lumbares among thoſe that perform the particular Motions of the Back.

## § 1. *Diaphragma.*

553. This is a very broad and thin Muſcle, ſituated at the Baſis of the Thorax, and ſerving as a tranſverſe Partition to ſeparate that Cavity from the Abdomen. For this reaſon the Greeks termed it Diaphragma, and the Latins, Septum Tranſverſum. It forms an oblique inclined Arch, the forepart of which is higheſt, and the poſterior Part loweſt, making a very acute Angle with the Back. *Situation in general and Figure.*

554. It is looked upon as a double and Digaſtric Muſcle, made up of two different Portions, one large and ſuperior, called the Great Muſcle of the Diaphragm; the other ſmall and inferior, appearing like an Appendix to the other, called the Small or Inferior Muſcle of the Diaphragm. *Diviſion.*

555. The great or principal Muſcle is fleſhy in its Circumference, and Tendinous and Aponeurotic in the middle, which for that reaſon is commonly called Centrum Nerveum ſive Tendinoſum. It muſt not however be imagined that this middle part is of ſmall extent, or that it is round, becauſe Anatomiſts have named it the Center; for in ſo doing, they had regard only to its Situation, not to its Form or to the Space it takes up. It is of a conſiderable breadth, and repreſents in ſome meaſure a Trefoil Leaf, ſuppoſing the part to which the Footſtalk is fixed, to be ſloped, and that this Slope is turned backward, and the middle Convex part forward; and therefore in the publick Courſes which I gave at the Royal Garden for the Space of twelve Years, I choſe to call it ſimply the middle Aponeuroſis or Aponeurotic Plane of the Diaphragm.

556. The fleſhy Circumference is Radiated, the Fibres of which it is made up, being fixed by one Extremity to the Edge of the middle Aponeuroſis, and by the other to all the Baſis of the Cavity of the Thorax, being inſerted by Digitations in the lower parts of the Appendix of the Sternum, of the loweſt true Ribs, of all the falſe Ribs, and in the neighbouring Vertebræ. *Inſertions.*

557. We have therefore three Kinds of Inſertions, one Sternal, twelve Coſtal, ſix on each ſide, and two Vertebral, one on each ſide. Theſe laſt are very ſmall, and ſometimes ſcarcely perceivable. The Coſtal Inſertions join thoſe of the Tranſverſalis Abdominis, but do not mix with them, as they ſeem to do, before the Membrane which covers them is removed. I need not mention here ſome communicating Fibres of the ſame Nature with

thoſe found in other Muſcles, as for inſtance, between the Obliquus Externus and Pectoralis Major.

558. The Fibres inſerted in the Appendix Enſiformis, run from behind directly forward, and form a ſmall parellel Plane. I have ſometimes obſerved a Faſciculus of Fibres detached from the under ſide of this Plane, to run down on the inſide of the Linea Alba, in which it is inſerted near the Umbilicus.

559. The firſt Coſtal Inſertion runs a little obliquely towards the Cartilage of the ſeventh true Rib, a triangular Space being left between this and the Sternal Inſertion, at which the Pleura and Peritonæum meet, as ſhall be ſaid hereafter. The Inſertion of theſe Fibres is very broad, taking up about two thirds of the Cartilage of the ſeventh Rib, and a ſmall part of the Bone, from whence it reaches beyond the Angle of the Cartilage.

560. The ſecond Inſertion is into the whole Cartilage of the firſt falſe Rib; the third partly in the Bone and partly in the Cartilage of the ſecond falſe Rib; the fourth in the Bone, and ſometimes a little in the Cartilage of the third falſe Rib; the fifth in the Bone and a little in the Cartilage of the fourth falſe Rib, being broader than the reſt.

561. The ſixth is in the Cartilage of the laſt falſe Rib, and almoſt through the whole length of the Bone. At the Head of this Rib, it joins the Vertebral Inſertion which runs from the lateral part of the laſt Vertebra of the Back, to the firſt Vertebra of the Loins.

562. Between this Vertebral Inſertion and the ſecond Muſcle of the Diaphragm, a ſmall triangular Interſtice is ſometimes left, like that which I mentioned in ſpeaking of the firſt Inſertion. This Inſertion and that in the laſt falſe Rib, join the upper Extremities of the Pſoas, and Triangularis, or Quadratus Lumborum, and ſends off to them ſome communicating Fibres. The common Plane of theſe laſt Inſertions, by the ſeparation of their Fibres, form a Hole, through which a bundle of Nerves paſſes.

563. It is to be obſerved, that the lateral Inſertions of the great Muſcle of the Diaphragm on the right ſide appear to be lower than thoſe on the left ſide; and that the right lateral Portion appears to be larger than the left, as being more arched.

564. The ſmall Muſcle of the Diaphragm is thicker than the other, but of much leſs extent. It is ſituated along the foreſide of the Bodies of the laſt Vertebra of the Back and ſeveral of thoſe of the Loins, being turned a little to the left Hand. It is of an oblong Form, repreſenting in ſome meaſure a fleſhy Collar, the two lateral Portions of which croſs each other, and afterwards become Tendinous towards the lower part.

565. The upper part of the Body of this Muſcle is fixed in the Slope of the middle Aponeuroſis of the great Muſcle. The outward Edges of the Alæ or lateral Portions join the poſterior Plane of the great Muſcle, and theſe Portions adhere to the Body of the laſt Vertebra of the Back. The Extremities called likewiſe Pillars or Crura, are inſerted by ſeveral Tendinous Digitations in the Vertebræ of the Loins.

566. The upper part of the fleſhy Body is formed by a particular Intertexture of Fibres belonging to the two Alæ. Theſe two Alæ, whereof that toward the right Hand is generally the moſt conſiderable, part from each other and form an oval Hole, terminated on the lower part by Fibres detached from the inſide of each Ala, immediately above the laſt Vertebra of the Back. Theſe Fibres decuſſate and croſs each other, and afterwards thoſe that come from each Ala, join that on the other ſide, ſo that each of the Crura is a Production of both Alæ.

567. The Fibres that come from the left Ala, croſs over thoſe from the right Ala, and this again ſends a ſmall Faſciculus of Fibres over thoſe of the left Ala; and afterwards the two Crura part from each other.

568. The right Crus is larger and longer than the left, and is always inſerted in the four upper Vertebræ of the Loins, and often in the fifth likewiſe, by the ſame number of Digitations, which become more and more Tendinous as they deſcend, and at length are expanded in form of an Aponeuroſis. This Crus lies more on the middle of the Bodies of the Vertebræ than on the right ſide.

569. The left Crus is ſmaller and ſhorter, and lies more on the ſides of the Vertebræ. It is fixed by Digitations to the three upper Vertebræ of the Loins, ſeldom reaching lower. The lower part of it is expanded in the ſame manner as the other; and the two Expanſions ſometimes meet together.

570. The oval Opening of this inferior Muſcle of the Diaphragm, gives Paſſage to the Extremity of the Æſophagus, and the Aorta lies in the Interſtice between the two Crura. Immediately above the Opening or Hole, a thin Faſciculus of Fibres is ſent off to the Stomach; and I have ſometimes obſerved a large Faſciculus at the lower Extremity of the Hole, ſent off chiefly from the right Ala, and accompanied by ſome Tendinous Fibres from the left; which ſeemed to run to the Meſentery.

571. In the middle Aponeuroſis of the great Muſcle, a little to the right of the Anterior part of the Slope, near the ſmall Muſcle, is a round Opening which tranſmits the Trunk of the lower Vena Cava. The Border or Circumference of this Opening, is very artfully formed by an oblique and ſucceſſive Intertexture of Tendinous Fibres, almoſt like the Edge of a Wicker Baſket; and is conſequently incapable either of Dilatation or Contraction, by the Action of the Diaphragm.

572. We find therefore three conſiderable Openings in the Diaphragm; one round and Tendinous for the paſſage of the Vena Cava; one oval and fleſhy for the Extremity of the Æſophagus; and one fork'd, partly fleſhy and partly Tendinous, for the Aorta. The round Opening is to the right Hand, cloſe to the upper part of the right Ala of the ſmall Muſcle; the oval Opening is a little to the left, ſo that the right Ala which is between theſe two Holes, lies almoſt directly over againſt the middle of the Body of the eleventh Vertebra of the Back; the Tendinous Fork is under the oval Opening, but a little more toward the middle.

573. This Situation well conſidered, will ſerve to juſtify in ſome meaſure, the Deſcriptions and Figures of the ancient Anatomiſts, eſpecially ſince the right Ala of the ſmall Muſcle is larger than the left, and ſince it was an eaſy matter in taking out the Diaphragm, and ſpreading it on a Board, to extend it too much toward both ſides.

## § 2. *Scaleni.*

*Situation in general and Diviſion.*

574. These are compound Muſcles, irregularly triangular, and from this Figure, the ancient Greeks gave them their name. They reckoned them to be only two in Number, ſituated laterally on the Vertebræ of the Neck, all the way down to the firſt and ſecond true Ribs. Afterwards they were divided into ſix, three lying on each ſide; but I have commonly found no more than two on each ſide; one lying upon the other; the firſt of which I name Scalenus Primus or Primæ Coſtæ, the other Scalenus Secundus or Secundæ Coſtæ.

575. The Scalenus Primus is fixed to the upper part of the outſide of the firſt Rib, by two diſtinct Portions, called commonly Branches, one Anterior, the other Poſterior. The Anterior Branch is fixed to the middle Portion of the Rib, about an Inch from the Cartilage. From thence it runs obliquely upward, and is inſerted in the tranſverſe Apophyſis of the ſixth, fifth, and ſometimes of the third Vertebra of the Neck.

576. The poſterior Branch is fixed more backward in the firſt Rib, an Interſtice of about an Inch being left between it and the other Branch, through which the Axillary Artery and Brachial Nerves are tranſmitted. From thence it runs up obliquely behind the former, and is inſerted in all the tranſverſe Apophyſes of the Neck.

577. The Scalenus Secundus is fixed a little more backward in the external Labium of the upper Edge of the ſecond Rib, ſometimes by two ſeparate Portions, and ſometimes without any Diviſion. The Anterior Portion is fixed immediately under the Poſterior Portion of the firſt Scalenus, by a ſhort flat Tendon, united a little with the firſt Intercoſtal Muſcle. From thence it runs up over the Poſterior Portion of the firſt Scalenus, communicating likewiſe with that Muſcle, and is fixed by Inſertions partly Tendinous and partly fleſhy, in the tranſverſe Apophyſes of the four firſt Vertebræ of the Neck.

578. The Poſterior Portion is fixed in the ſecond Rib more backward than the other. From thence it runs up, being divided into two Portions, whereof one is inſerted in the tranſverſe Apophyſes of the three firſt Vertebræ of the Neck, behind the Scalenus Primus. The other Portion runs up behind the former, and is inſerted in the tranſverſe Apophyſes of the two firſt Vertebræ.

579. The Vertebral Inſertions of both Scaleni, vary, they being ſometimes confounded with each other, and ſometimes with thoſe of the neighbouring Muſcles. Behind the Scalenus Secundus, there is a ſmall fleſhy Plane inſerted in the tranſverſe Apophyſis of the laſt Vertebra of

the Neck, and in the ſecond Rib. This does not belong to the Scaleni, but is the firſt of the Muſculi Supra-Coſtales, or Levatores Coſtarum, as they are commonly called.

580. In diſſecting the Anterior Portion of the ſecond Scalenus, I have obſerved a ſmall Muſcle fixed to the Extremity of the tranſverſe Apophyſis of the laſt Vertebra of the Neck, which having run down from thence to the inner and lower part of the firſt true Rib, was ſlightly inſerted there, and ſeemed to continue its courſe to the Convex ſide of the Pleura. I have likewiſe ſeen all the Scaleni inſerted in the firſt Rib.

### § 3. *Serratus Poſticus Superior.*

*Situation in general and Inſertions.*

581. This is a flat thin Muſcle, ſituated on the upper Part of the Back. It is fixed on one ſide by a broad Aponeuroſis, to the lower part of the Poſterior Cervical Ligament, and to the Spinal Apophyſes of the two laſt Vertebræ of the Neck, and two firſt of the Back.

582. From thence it runs down a little obliquely forward, and is inſerted by broad fleſhy Digitations, in the Poſterior part of the ſecond, third, fourth, and ſometimes of the fifth true Ribs, near their Angles; but ſometimes it has no Inſertion in the ſecond Rib. It is covered by and cloſely united with the Rhomboides.

### § 4. *Serratus Poſticus Inferior.*

*Situation in general and Inſertions.*

583. This is a flat thin Muſcle lying on the lower part of the Back. It is fixed in the laſt Spinal Apophyſis of the Back, and in the three firſt of the Loins by a broad Aponeuroſis. From thence it runs up a little obliquely, and is fixed by fleſhy broad Digitations in the laſt four falſe Ribs. Its Inſertions in the loweſt Rib is near the Cartilage, and in the other three near their Angles. It is covered by the Latiſſimus Dorſi, to which it adheres very cloſely, and it covers the Sacro-Lumbaris and Longiſſimus Dorſi.

### § 5. *Intercoſtales.*

*Situation in general and Diviſion.*

584. The Intercoſtal Muſcles are thin fleſhy Planes, lying in the Interſtices between the Ribs, their Fibres running obliquely from one Rib to another. In each Interſtice lie two Planes, an External and an Internal, cloſely joined together, nothing but a thin, fine, cellular, membranous Web coming between them.

585. According to this natural Diviſion, there muſt be forty four Intercoſtal Muſcles, in the twenty two Interſtices left between the twenty four Ribs; and of theſe there are eleven External, and eleven Internal on each ſide. The Fibres of the external Intercoſtals run down from behind forward, and thoſe of the internal Intercoſtals from before backward; ſo that the Fibres of theſe two Series of Muſcles croſs each other.

586. The external Intercoſtals extend commonly from the Vertebræ to the Extremity of the upper Labium of the bony Portion of each Rib, and go no further. The Internal begin forward near the Sternum, and end backward at the Angle of each Rib.

587. Therefore between theſe Angles and the Cartilages, theſe fleſhy Planes are double, the Fibres by their oppoſite Directions repreſenting this kind of Figure X. But from the Vertebræ to the bony Angles, and in the Interſtices between the Cartilaginous Portions, the Plane is ſingle, being that of the external Muſcles, backward, and of the internal, forward.

588. The Fibres of the external Intercoſtals are very oblique near the Vertebræ; but this Obliquity decreaſes inſenſibly towards the Anterior Extremities of the Ribs. Their Inſertions begin at the Ligaments by which the Ribs are faſtened to the tranſverſe Apophyſes. They are a little Tendinous, and run a ſmall Space beyond the Edge, on the outſide of each Rib.

589. The Fibres of the internal Intercoſtals are in general ſhorter and leſs oblique than the former. They fill almoſt intirely the Interſtices between the Cartilaginous Portions, and they are covered on the outſide by a Ligamentary Membrane, the Fibres of which running in an oppoſite Direction to thoſe of the Muſcles, have been miſtaken for Continuations of the external Intercoſtals, over which this Membrane is likewiſe ſpread, only a little diminiſhed in thickneſs.

590. Any Portion of the Breaſt of an Animal may be boiled ſo much, as that the Fleſh ſhall eaſily part from the Bones, and the Ribs may be drawn out, diſordering neither the Muſcles nor Membranes. But we are not from thence to conclude, that all the Intercoſtals on one ſide of the Thorax, make but one Muſcle, becauſe by the ſame way of reaſoning it might be proved that all the Muſcles which immediately ſurround the Os Femoris are but one, ſince by a like Experiment, they together with the Perioſteum, may be entirely ſeparated from the Bone, without breaking their Fibres.

## § 6. *Supra-Coſtales.*

*Situation in general.* 591. These Muſcles are commonly called Levatores Coſtarum, which name was firſt given them by *Steno*, but he did not pretend to have diſcovered them. They are irregularly Triangular, and ſituated on the back part of the Ribs near the Vertebræ.

*Inſertions.* 592. Each of theſe Muſcles is fixed by one Tendinous Extremity in the tranſverſe Apophyſis which lies above the Articulation of each Rib, and to the neighbouring Ligament; the firſt being inſerted in the tranſverſe Apophyſis of the laſt Vertebra of the Neck, and the laſt, in that of the eleventh Vertebra of the Back.

593. From thence the fleſhy Fibres run down obliquely, increaſing in breadth as they deſcend, and are inſerted in the back part of the outſide of the following Rib. Some of the Fibres often paſs beyond that Rib,

and are fixed in one or more of the Ribs below it by ſeveral Digitations, which lie at a greater diſtance from the Vertebræ in proportion as they run lower. In the inferior Ribs theſe Digitations are more conſiderable than in the ſuperior.

### § 7. *Sub-Coſtales.*

*Situation in general.* 594. These are fleſhy Planes of different breadths and very thin, ſituated more or leſs obliquely on the inſides of the Ribs near their bony Angles, and running in the ſame Direction with the external Intercoſtals.

*Inſertions.* 595. They are fixed by both Extremities in the Ribs; the inferior Extremity being always at a greater diſtance from the Vertebræ, than the ſuperior, and ſeveral Ribs lying between the two Inſertions.

596. These Muſcles are more ſenſible in the lower Ribs than in the upper, and they adhere cloſely to the Ribs that lie between their Inſertions.

### § 8. *Sterno-Coſtales vulgo Triangularis Sterni.*

*Situation in general.* 597. These are five Pairs of fleſhy Planes diſpoſed more or leſs obliquely on each ſide the Sternum, on the inſide of the Cartilages of the ſecond, third, fourth, fifth and ſixth true Ribs.

*Inſertions.* 598. They are inſerted by one Extremity in the Edges of the inſide of all the lower half of the Sternum. From thence the firſt Muſcle on each ſide runs up obliquely, and is fixed in the Cartilage of the ſecond Rib. The ſecond runs leſs obliquely to its Inſertion in the Cartilage of the third Rib. The reſt are inſerted in the ſame manner in the Cartilages of the following Ribs; their Obliquity decreaſing, and their length increaſing in proportion as they are ſituated lower down; ſo that the loweſt is almoſt tranſverſe.

599. This laſt Muſcle which is fixed by one Extremity in the Cartilage of the ſixth true Rib near the Bone, ſeems to paſs the Appendix Enſiformis, immediately above the Inſertion of the Diaphragm in that Appendix, and to join the Muſcle on the other ſide. The ſuperior Portions of the tranſverſe Muſcles of the Abdomen, united with the loweſt Sterno-Coſtales, have nearly the ſame appearance, ſo that theſe might be reckoned to belong to the Tranſverſales, did not the Inſertion of the Diaphragm come between them.

## ART. XIV.

### *The Muſcles which move the Head on the Trunk.*

*Diviſion.* 600. THE Head has proper Motions diſtinct from thoſe of the Neck, and others common to it with the Neck. The Muſcles which ſerve particularly for theſe Motions are of two kinds, ſome of them being fixed by one Extremity in the Head, and the reſt having no Inſertion in that part. Thoſe of the firſt kind are commonly twenty in number, to which four more are added, though they have no Inſertion in the Head.

*Enumeration* 601. THEIR number therefore amounts to twenty four, twelve lying on each ſide, viz.

1. *Sterno-Maſtoidæus ſive Maſtoidæus Anterior.*
2. *Splenius ſive Maſtoidæus Poſterior.*
3. *Complexus.*
4. *Complexus Minor ſive Maſtoidæus Lateralis.*
5. *Rectus Major.*
6. *Rectus Minor.*
7. *Oliquus Minor ſive Superior.*
8. *Obliquus Major ſive Inferior.*
9. *Rectus Anticus Longus.*
10. *Rectus Anticus Brevis.*
11. *Tranſverſalis Anticus Primus.*
12. *Tranſverſalis Anticus Secundus.*

*Situation in general.* 602. OF theſe twelve Muſcles five are Anterior, ſix Poſterior, and one Lateral.

603. THE five Anterior are the Sterno-Maſtoidæus, Rectus Anticus Longus, Rectus Anticus Brevis, Tranſverſalis Anticus Primus, Tranſverſalis Anticus Secundus, which laſt is not inſerted in the Head.

604. THE ſix Poſterior are the Splenius, Complexus Major, Rectus Major, Rectus Minor, Obliquus Superior, Obliquus Inferior, which laſt is not fixed in the Head. The Lateral Muſcle is the Complexus Minor.

605. THERE are beſides theſe, ſometimes, ſmall ſupernumerary Muſcles, which I ſhall mention after thoſe to which they belong; and I ſhall likewiſe give the reaſon why I retain the Obliquus Inferior, and Tranſverſalis Anticus Secundus, though they belong more properly to the Neck than to the Head.

## § 1. *Sterno-Maſtoidæus ſive Maſtoidæus Anterior.*

*Situation in general and Diviſion.* 606. THIS is a long, narrow, pretty thick and moſtly fleſhy Muſcle, ſituated obliquely between the back part of the Ear, and lower part of the Throat. It is in a manner compoſed of two Muſcles united at the upper part through their whole breadth and ſeparated at the lower.

*Inſertions.* 607. IT has two Inſertions below, both of them flat and a little Tendinous. The firſt is in the upper Edge of the Sternum near the Articulation of the Clavicula; the other in the Clavicula at a ſmall diſtance from the Sternum. Theſe two Portions run up obliquely, and unite together at about an Inch above their lower Inſertions, the triangular Space left between them being filled by a Membrane.

608. THE Sternal Portion paſſes foremoſt and covers the Clavicular, both forming one Body or Belly, which running in the ſame oblique Direction

to the Apophyſis Maſtoidæus, is inſerted in the upper and back part of that Proceſs; over which it likewiſe ſends off a very broad Aponeuroſis, which covers the Splenius and is inſerted in the Os Occipitis.

609. The two Anterior Maſtoidæi repreſent a great Roman V, the Angle being at the lower part of the Throat, and the two Crura running up behind the Ears, as may be plainly ſeen without Diſſection.

## § 2. *Splenius ſive Maſtoidæus Poſterior.*

*Situation in general and Diviſion.*

610. This is a flat, broad, oblong Muſcle, ſituated obliquely between the back part of the Ear and the poſterior and lower part of the Neck. It is partly ſingle, and partly made up of two Portions, one Superior, the other Inferior. Theſe two Portions are cloſely united backward, making only one Plane, but they are divided above.

611. The ſuperior Portion is fixed to the Extremities of the three or four loweſt Spinal Apophyſes of the Neck, and of the firſt, or firſt and ſecond of the Back. It is not fixed immediately to the Apophyſes of the Neck which are above the laſt, but only by the Intervention of the Poſterior Cervical Ligament.

612. It is likewiſe fixed to the Edge of the Inter-Spinal Ligaments of the other Vertebræ, and therefore its Inſertions in the Spinal Apophyſes are not interrupted by the diſtances between theſe Apophyſes, but form one thin continued Plane a little Tendinous.

613. From thence it runs up obliquely toward the Maſtoide Apophyſis, partly under the upper Extremity of the Sterno-Maſtoidæus, and is inſerted in the upper part of that Proceſs, and along the neighbouring Curve Portion of the tranſverſe Ridge of the Os Occipitis.

614. The inferior Portion of the Splenius is fixed to three or four Spinal Apophyſes of the Back, beginning by the ſecond or third. From thence it runs up, being cloſely united to the other Portion, till it reaches the ſuperior and lateral part of the Neck, where it ſeparates from it, and is inſerted in the tranſverſe Apophyſes of the three or four ſuperior Vertebræ of the Neck, by the ſame number of Extremities a little Tendinous, which however are ſometimes only two in number. This Portion of the Splenius belongs rather to the Neck than to the Head.

615. The two Splenii repreſent a great Roman V; and the Splenius and Sterno-Maſtoidæus of the ſame ſide, form a Figure like a Roman A or the Legs of a Pair of Compaſſes, the Points whereof are in an Horizontal Plane. Thus theſe four Muſcles ſurrounding the Neck, meet alternately at their upper and lower Extremities.

## § 3. *Complexus.*

*Situation in general.*

616. This is a pretty long and broad Muſcle lying on the poſterior lateral part of the Neck, all the way to the Occiput. It is complicated by

reaſon of the Decuſſations of its different Portions, from which it has its name, but is commonly looked upon to be one Muſcle.

*Inſertions.* 617. It is fixed below by ſmall ſhort Tendons to the tranſverſe Apophyſes of all the Vertebræ of the Neck except the firſt, to which it is fixed only near the Root of its tranſverſe Apophyſis. From thence it runs up obliquely backward, croſſing under the Splenius, and often communicating with it by ſome Faſciculi of Fibres.

618. It is afterwards inſerted above by a broad fleſhy Plane in the poſterior part of the ſuperior tranſverſe Line of the Os Occipitis, near the Criſta or Spine of that Bone. At its Inſertion it joins by one Edge the Complexus of the other ſide, and by the other, the Splenius which covers it a little.

619. Before we diſſect the Splenii, we may ſee in the Interſtice left between their ſuperior Portions, the two Complexi united together on the Spine of the Os Occipitis.

### § 4. *Complexus Minor ſive Maſtoidæus Lateralis.*

*Situation in general.* 620. This is a long, ſlender, narrow, indented Muſcle, lying along all the ſide of the Neck up to the Ear, where it increaſes a little in breadth. It is ſomething like the Complexus Major, and *Veſalius* took it to be a Portion of that Muſcle.

*Inſertions.* 621. It is fixed by one Extremity in all the tranſverſe Apophyſes of the Neck, except the firſt, by the ſame Number of Digitations or Branches moſtly fleſhy and diſpoſed obliquely.

622. From thence it aſcends, and having reached above the tranſverſe Apophyſis of the firſt Vertebra, it forms a ſmall broad Plane, by which it is inſerted in the poſterior part of the Apophyſis Maſtoidæus. It is here covered by the Splenius, and covers a little the Obliquus Superior.

623. This Muſcle is often miſtaken for a Portion of the Longiſſimus Dorſi.

### § 5. *Rectus Major.*

*Situation in general.* 624. This is a ſmall, flat, ſhort Muſcle, broad at the upper part and narrow at the lower; and though it is called Rectus, it is ſituated obliquely between the Occiput and ſecond Vertebra of the Neck.

*Inſertions.* 625. It is fixed below to one Branch of the Bifurcated Spine of the ſecond Vertebra of the Neck, at a Tuberoſity which is often found at the upper part of that Branch. From thence it aſcends a little obliquely outward, and is inſerted in the poſterior part of the inferior tranſverſe Line of the Os Occipitis, at a ſmall diſtance from the Criſta, being a little covered by the Obliquus Superior.

### § 6. *Rectus Minor.*

626. This Muſcle is like the former, and it has alſo a ſmall Inſertion below, in the poſterior Eminence of the firſt Vertebra. From thence it aſcends laterally and is inſerted immediately under the poſterior Part of the inferior tranſverſe Line of the Os Occipitis, in a ſuperficial Foſſula on one ſide of the Criſta Occipitalis. *Situation and Inſertions.*

### § 7. *Obliquus Superior ſive Minor.*

627. This Muſcle is ſituated laterally between the Occiput and firſt Vertebra, being nearly of the ſame Figure with the two Recti. It is fixed to the end of the tranſverſe Apophyſis of the firſt Vertebra; from whence it runs upward and very obliquely backward, and is inſerted in the tranſverſe Line of the Os Occipitis, almoſt at an equal diſtance from the Criſta and Maſtoide Apophyſis, between the Rectus Major and Complexus Minor, which covers it a little. *Situation and Inſertions.*

### § 8. *Obliquus Inferior ſive Major.*

628. It is ſituated in a contrary Direction to the Obliquus Superior, between the firſt and ſecond Vertebra of the Neck, reſembling that Muſcle in every thing but the ſize. It is fixed below to one Ramus of the bifurcated Spinal Apophyſis of the ſecond Vertebra, near the Inſertion of the Rectus Major; from whence it runs obliquely upward and outward, and is inſerted in the end of the tranſverſe Apophyſis of the firſt Vertebra under the lower Inſertion of the Obliquus Superior. *Situation in general and Inſertions.*

### § 9. *Rectus Anticus Longus.*

629. This Muſcle is in ſome meaſure of a Pyramidal Figure, lying along the anterior and lateral parts of the Vertebræ of the Neck, all the way up the Baſis Cranii. *Situation in general.*

630. It is fixed to the anterior parts of the tranſverſe Apophyſes of the third, fourth, fifth, and ſixth Vertebræ in a digitated manner. From thence it runs up obliquely inward towards the lateral parts of the Bodies of the Vertebræ, paſſes on the foreſide of the firſt and ſecond without being inſerted in them, and approaching gradually towards the ſame Muſcle on the other ſide, it is inſerted near it, in the forepart of the lower ſide of the Apophyſis Baſilaris, or great Apophyſis of the Os Occipitis. *Inſertions.*

### § 10. *Rectus Anticus Brevis.*

631 This is a ſmall flat Muſcle, about the breadth of one Finger, ſituated laterally on the anterior part of the Body of the firſt Vertebra. It is *Situation and Inſertions.*

is fixed below to the Baſis or Root of the Tranſverſe Apophyſis of that Vertebra, near the anterior Eminence.

632. From thence it runs obliquely upward and inward to a tranſverſe Impreſſion in the lower ſide of the Apophyſis Baſilaris of the Occipital Bone, immediately before the Condyle on the ſame ſide, being covered by the Rectus Anticus Longus.

## § 11. *Tranſverſalis Anticus Primus.*

*Situation in general and Inſertions.*

633. This is a ſmall, pretty thick and wholly fleſhy Muſcle, about the breadth of a Finger, ſituated between the Baſis of the Os Occipitis and the tranſverſe Apophyſis of the firſt Vertebra. It is fixed by one end in the anterior part of that Apophyſis; and from thence turning up a little obliquely, it is inſerted by the other end in a particular Impreſſion between the Condyle of the Os Occipitis and the Maſtoide Apophyſis of the ſame ſide, behind the Apophyſis Styloides and under the Edge of the Jugular Foſſula.

## § 12. *Tranſverſalis Anticus Secundus.*

634. This is a ſmall Muſcle ſituated between the tranſverſe Apophyſes of the firſt two Vertebræ of the Neck. It is fixed by one Extremity very near the middle of the ſecond Apophyſis, and by the other near the Root or Baſis of the firſt; and therefore it is a Muſcle of the Neck rather than of the Head.

## § 13. *Muſculi Acceſſorii.*

635 We ſometimes meet with a ſmall Muſcle fixed by one end to the Extremity of the firſt tranſverſe Apophyſis of the Neck near the Inſertions of the two Obliqui; from whence running up obliquely it is again inſerted behind the Maſtoide Apophyſis. This Muſcle is commonly thought to be a third ſmall Tranſverſalis on that ſide where it is found, but it ſeems rather to be an additional Muſcle to the Obliquus Superior. The Recti and other Obliqui are likewiſe ſometimes found double.

636. I call all theſe Muſcles Acceſſorii or Supernumerary, becauſe they are ſometimes wanting, and becauſe when they are found, they vary both in Number and Situation.

## ART. XV.

### The Vertebral Muſcles in general.

637. THE Muſcles which lie along the Spine, the greateſt part whereof ſerve for the Motions of the Neck, Back, and Loins, have by the greateſt Anatomiſts been thought very difficult to be well diſſected, and clearly deſcribed, eſpecially thoſe of the Back. All theſe Muſcles are very complex, interwoven with each other, and multiplied in various manners, ſo that it becomes neceſſary either to make their number much greater than that of the Vertebræ, or to reduce them to a ſmall number of long Muſcles interſected at different places.

638. *STENO*, in order to facilitate the Knowledge, Diſſection and Deſcription of theſe Muſcles, thought proper to rank them in the following manner. By Vertebral Muſcles he underſtands thoſe which are fixed in the Vertebræ alone; and he diſtinguiſhes them all into Recti and Obliqui. The Recti are thoſe which run parallel to the Medulla Spinalis, or whoſe Direction is longitudinal. The Obliqui are thoſe which run obliquely between the Spinal and tranſverſe Apophyſes.

639. He divides the Recti into Middle and Lateral. The middle Recti are thoſe which are fixed to the Spinal Apophyſes; the lateral thoſe fixed to the tranſverſe Apophyſes. He moreover divides all theſe Muſcles into Simple and Compound; the Simple being thoſe which are fixed in two Vertebræ only; the Compound, thoſe fixed in more than two.

640. The Obliqui according to him are of two kinds. Some run up from the Tranſverſe to the Spinal Apophyſes, approaching each other; and ſome run up from the Spinal to the Tranſverſe Apophyſes, diverging from each other. The firſt ſort he terms *ad Medium Vergentes*; the ſecond *a Medio recedentes*. Theſe terms are borrowed from Optics, and accordingly theſe two kinds of Muſcles might be named Converging and Diverging Muſcles. Laſtly he adds, that ſeveral Muſcles of the firſt kind go from one Tranſverſe to ſeveral Spinal Apophyſes; and from ſeveral Tranſverſe to one Spinal Apophyſis.

641. According to this account of the Vertebral Muſcles, the ancient terms Spinales, Tranſverſales and Semi-Spinales, may ſtill be applied to them; underſtanding by Spinales thoſe Muſcles which are wholly fixed in the Spinal Apophyſes; by Tranſverſales thoſe which are wholly fixed in the Tranſverſe Apophyſes; and by Semi-Spinales thoſe which are fixed in the Spinal Apophyſes by one Extremity only. At preſent the two kinds of oblique Vertebral Muſcles are better expreſſed by the two compound terms Tranſverſo-Spinales and Spino-Tranſverſales.

642. It is however neceſſary ſtill to retain the general names of Vertebrales Recti, Vertebrales Obliqui, &c. becauſe though the terms already mentioned agree very well to the Poſterior Obliqui, they cannot be applied

to the Anterior Obliqui, one end of which is fixed not in the Spinal Apophyſes, but in the Bodies of the Vertebræ.

643. The ſmall ſimple Muſcles that go only between two Vertebræ, may be termed Vertebrales Minores; and the large compound Muſcles that reach ſeveral Vertebræ, Vertebrales Majores, both ſorts being afterwards divided into Spinales and Tranſverſales Majores and Minores. The ſmall Muſcles are likewiſe called Inter-Spinales and Inter-Tranſverſales; and as there are ſome ſmall oblique Muſcles which cannot be ſaid to reach either the Tranſverſe or Spinal Apophyſes; theſe may be termed ſimply Inter-Vertebrales.

644. The Tranſverſo-Spinales that go from ſeveral Tranſverſe to one Spinal Apophyſis are diſpoſed in this manner. The Portion that comes from the moſt diſtant Tranſverſe Apophyſis is inſerted in the Extremity of the Spinal Apophyſis, the Portion from the next Tranſverſe Apophyſis is inſerted more laterally, and the ſame Rule holds in all the other Portions, except in that which comes from the Tranſverſe Apophyſis which is neareſt the Spinal Apophyſis.

645. This laſt Portion is not fixed in the Spinal Apophyſis, but rather in its Root or Baſis, and likewiſe very near the Baſis of the Tranſverſe Apophyſis, ſo that it is more properly Inter-Vertebralis than Tranſverſo-Spinalis. Thus in the Tranſverſo-Spinales that go from the ninth, eighth, ſeventh and ſixth Tranſverſe Apophyſes of the Back, to the fifth Spinal Apophyſis of the ſame Claſs, we find that the laſt and ſmalleſt is fixed in the Baſis of the ſixth Tranſverſe and of the fifth Spinal Apophyſis.

646. The Tranſverſo-Spinales which go from one Tranſverſe to ſeveral Spinal Apophyſes, are diſpoſed in this manner. The Portion that goes from the Baſis, or near the Baſis of the Tranſverſe Apophyſis, is fixed either in or near the Baſis of the Spinal Apophyſis immediately above it. The next Portion which is more diſtant from the Baſis of the Tranſverſe Apophyſis, runs up beyond the next Spinal Apophyſis, and is inſerted in that above it, a little further from the Baſis.

647. The other Portions obſerve the ſame order, that which comes from the Apex of the Tranſverſe Apophyſis, being inſerted in the Apex of the moſt diſtant Spinal Apophyſis. From this Diſpoſition we ſee that the moſt ſuperior Vertebral Muſcles which go from one Tranſverſe to ſeveral Spinal Apophyſes, are the moſt inferior of thoſe which go from ſeveral Tranſverſe to one Spinal Apophyſis.

648. It muſt be obſerved, that in ſpeaking of the oblique Vertebral Muſcles, I conſider their Direction from below upward and not from above downward, becauſe the inferior Vertebræ commonly ſupport thoſe above them, except when a Perſon ſtands upon his Head, with his Feet erect, in which Caſe the ſuperior Vertebræ ſuſtain the inferior.

649. We ought likewiſe to remark, that in ſpeaking of theſe Muſcles the term Tranſverſalis is more proper than Tranſverſus, which laſt points out a certain Direction very different from that which theſe Muſcles have; whereas the other marks the relation which they have to the Tranſverſe Apophyſes.

650. Besides the Vertebral Muſcles properly ſo called, ſeveral other Muſcles not inſerted wholly in the Vertebræ, ſerve to move them. Some of the Ancients called theſe Semi-Spinales, to diſtinguiſh them from thoſe they termed Spinales, which included all the Vertebral Muſcles; and therefore as we have termed theſe Vertebrales, the others may be named Semi-Vertebrales.

651. Among the Vertebrales properly ſo called, ſome from their Inſertions, ſeem to be common to the Neck and the Back, ſome to the Back and Loins; but for Diſtinction's ſake I reckon among thoſe of the Neck, not only the Muſcles intirely fixed in the Vertebræ thereof, but alſo thoſe whoſe ſuperior Inſertion is in the ſeventh Vertebra of the Neck, though all their other Inſertions be in thoſe of the Back; and I obſerve the ſame Method with reſpect to the Loins.

652. All theſe Muſcles vary very much in their Inſertions and reciprocal Communications; by which laſt they are often ſo much confounded together, that it is a very difficult matter to diſtinguiſh them for thoſe who are not previouſly acquainted with them. In general they are more eaſily diſtinguiſhed in Children than in Adults, and in Adults than in very aged Perſons.

653. In deſcribing theſe Muſcles I confine myſelf chiefly to what I have moſt commonly obſerved myſelf; without pretending to contradict or diſcredit what other very great Anatomiſts have publiſhed about them.

## ART. XVI.

### *The Vertebral Muſcles in particular.*

*Muſcles of the Neck.*

654. The Muſcles that move the Neck in particular, are very many in number, as has been already obſerved in ſpeaking of the Vertebral Muſcles in general; but in order to ſhun all confuſion and eaſily to form an Idea of them, they may be taken collectively, and thereby be reduced to twelve, ſix on each ſide, of which one is ſituated on the foreſide of the Neck, the reſt on the backſide.

655. The Muſcle, which with its fellow lies on the foreſide of the Neck is named

1. *Longus Colli.*

656. Those on the backſide are

2. *Tranſverſalis Colli Major.*
3. *Tranſverſalis Gracilis ſive Collateralis Colli.*
4. *Semi-Spinalis ſive Tranſverſo-Spinalis Colli.*
5. *Spinales Colli parvi ſive Inter-Spinales.*
6. *Tranſverſales Colli Minores ſive Inter-Tranſverſales.*

657. The Spinales Minores and Tranſverſales Minores are here reckoned collectively; for if we take them ſeparately, there are ſix or ſeven of each ſort on each ſide of the Neck; neither is the number of them always the ſame. The Tranſverſalis Gracilis has often been looked upon as a Portion of that long Muſcular Maſs termed Longiſſimus Dorſi. It has likewiſe been taken by ſome for the Cervicalis Deſcendens of Diemerbroek, and by others it has been called Acceſſorius Stenonis.

658. We ought likewiſe to reckon among the Muſcles of the Neck, two which have been deſcribed among thoſe of the Head, viz.

7. *Obliquus Major.* 8. *Rectus Minor.*

659. I do not ſpeak here of other Muſcles which aſſiſt in moving the Neck, that is, all thoſe that move the Head, except the ſmall ones inſerted in the Cranium, and in the firſt Vertebra of the Neck.

### § 1. *Longus Colli.*

*Situation in general and Inſertion.* 660. This Vertebral Muſcle is made up of ſeveral others, ſituated laterally along the foreſide of all the Vertebræ of the Neck, and ſome of the upper Vertebræ of the Back.

*Diviſion.* 661. It may be divided into two Portions; one Superior, conſiſting of oblique Converging Muſcles, and one Inferior, compoſed of oblique Diverging Muſcles.

662. The Superior Portion is covered by the Rectus Anticus Longus of the Head. The Muſcles of which it conſiſts are fixed below, to all the Tranſverſe Apophyſes that lie between the firſt Vertebra and the laſt. From thence they run up obliquely, and are inſerted in the Anterior Eminence of the firſt Vertebra, and in the Bodies of the three following. The Inſertion in the Eminence is ſo cloſely united to the Ligament which goes to the Os Occipitis, that it can hardly be diſtinguiſhed from it.

663. The Inferior Portion appears almoſt ſtraight, and yet all the Muſcles that compoſe it are Diverging, or directed obliquely outward. They are fixed below, to the Anterior lateral part of the Body of the laſt Vertebra of the Neck, and of the firſt three of the Back, and ſometimes of more. From thence they run upward and a little obliquely outward, and are inſerted near the Tranſverſe Apophyſes of all the Vertebræ of the Neck, except the firſt and laſt.

664. Though theſe two Portions ſeem to be confounded with each other, they may nevertheleſs be eaſily diſtinguiſhed by an oblique Line that runs between them from the Tranſverſe Apophyſis of the ſecond Vertebra to the Body of the ſixth.

665. All the Inſertions of this Muſcle are more or leſs Tendinous.

§ 2. *Tranſ-*

### § 2. *Tanſverſalis Colli Major.*

666. This is a long thin Muſcle, placed along all the Tranſverſe Apophyſes of the Neck, and the four, five or ſix upper Apophyſes of the Back, between the Complexus Major and Minor, lying, as it were, on the Inſertions of the firſt of theſe Muſcles. *Situation in general.*

667. It is compoſed of ſeveral ſmall Muſcular Faſciculi which run directly from one or more Tranſverſe Apophyſes, and are inſerted ſometimes in the Apophyſis neareſt to theſe, ſometimes in others more remote, the ſeveral Faſciculi croſſing each other between the Inſertions of the two Complexi, which are likewiſe croſſed by them. They have ſometimes a Communication with the Longiſſimus Dorſi, but this is not uniform. *Inſertions.*

### § 3. *Tranſverſalis Gracilis ſive Collateralis Colli.*

668. This is a long thin Muſcle, reſembling the Tranſverſalis Major in every thing but Size, and ſituated on the ſide of that Muſcle. It is commonly taken for a Portion or Continuation of the Sacro-Lumbaris. *Diemerbroek* diſtinguiſhed it by the name of Cervicalis Deſcendens; and *Steno* and others after him, have called it Acceſſorius Muſculi Sacro-Lumbaris, in ſpeaking of which Muſcle I ſhall have occaſion to mention it again.

### § 4. *Semi-Spinalis ſive Tranſverſo-Spinalis Colli.*

669. This name is given to all that fleſhy Maſs which lies between the Tranſverſe and Spinal Apophyſes from the ſecond Vertebra of the Neck to the middle of the Back; the Splenius and Complexus Major which cover it, having been raiſed. *Situation.*

670. It is compoſed of ſeveral oblique Converging Muſcles, which may be divided into External and Internal, and of theſe the External are the longeſt. *Diviſion.*

671. The External are fixed below, to the Tranſverſe Apophyſes of the ſix, ſeven, eight or nine upper Vertebræ of the Back, by Tendinous Extremities, which, as they aſcend, become fleſhy, and mix with each other. Their Superior Inſertions in the Neck, are ſix in number, whereof the firſt which is Tendinous, is in the ſeventh Spinal Apophyſis; the reſt which are fleſhy, are in the five next Spinal Apophyſes.

672. The loweſt of theſe External Muſcles mix more or leſs by ſome communicating fleſhy Fibres, with the Spinalis, Longiſſimus, and Semi-Spinalis Dorſi.

673. The Internal are ſhorter and more oblique than the External, and partly covered by them. They are fixed by their lower Extremities to the Tranſverſe Apophyſes of the three or four upper Vertebræ of the Back, and to the Oblique Apophyſes of the four or five lower Vertebræ of the

Neck; and by their other Extremities they are inſerted in the ſix Spinal Apophyſes of the Neck.

674. SOME of theſe internal Muſcles are very ſhort, lying wholly between the Spinal Apophyſes and the Oblique or Tranſverſe Apophyſes next them.

### § 5. *Spinales Colli Minores.*

*Situation and Inſertions.* 675. THESE Muſcles lie between the ſix Spinal Apophyſes of the Neck, and between the laſt of the Neck and firſt of the Back, being inſerted in theſe Apophyſes by both Extremities on one ſide of the poſterior Cervical Ligament, which parts them from thoſe on the other ſide. They are likewiſe termed Inter-Spinales.

### § 6. *Tranſverſales Colli Minores.*

676. THESE are very ſmall ſhort Muſcles, found in the Interſtices of ſeveral Tranſverſe Apophyſes in which they are inſerted. They are likewiſe termed Inter-Tranſverſales.

*Muſcles of the Back, Loins and Os Coccygis.* 677. THE Muſcles which move the Vertebræ of the Back and Loins would amount to a much greater number, and be much more difficult to conceive than thoſe of the Neck, were they to be reckoned ſeparately as Vertebral or Semi-Vertebral Muſcles. It is therefore proper to reduce them to a collective number which may conveniently enough be fixed to twenty four, twelve on each ſide, viz.

1. *Sacro-Lumbaris.*
2. *Longiſſimus Dorſi.*
3. *Spinalis Dorſi Major.*
4. *Spinales Dorſi Minores.*
5. *Tranſverſalis Dorſi Major.*
6. *Tranſverſales Dorſi Minores.*
7. *Semi-Spinalis ſive Tranſverſo-Spinalis Dorſi.*
8. *Semi-Spinalis ſive Tranſverſo-Spinalis Lumborum, Sacer Veterum.*
9. 10. *Spinales & Tranſverſales Lumborum.*
11. *Quadratus Lumborum ſive Lumbaris Externus.*
12. *Coccygæi.*

678. THE Vertebræ of the Back, and eſpecially thoſe of the Loins, may likewiſe be moved by the Muſcles of the Abdomen, as has been already obſerved. The inferior Portion of the Longus Colli may contribute ſomething to the Motion of the upper Vertebræ of the Back; the Pſoas to that of the Vertebræ of the Loins, and the Glutæus Maximus to that of the Os Coccygis.

### § 7. *Sacro-Lumbaris.*

*Situation and Name.* 679. THIS is a long Complex Muſcle, narrow and thin at the upper part, broad and thick at the lower, repreſenting a kind of flat Pyramid. It t lies between the Spine and poſterior part of all the Ribs, and along the back part of the Regio Lumbaris, all the way to the Os Sacrum.

680. Through all this Space it is cloſely accompanied by the Longiſſimus Dorſi, which lies between it and the Spinal Apophyſes of the Vertebræ, a narrow, fatty or cellular Line running between them. The name of Lumbo-Coſtalis would better expreſs the Situation of this Muſcle than that of the Sacro-Lumbaris. It might be termed Medius Dorſi to diſtinguiſh it from the Latiſſimus and Longiſſimus Dorſi, between which it is placed.

*Inſertions.*

681. It is fixed below by a broad thin Tendinous Aponeuroſis to the ſuperior Spines of the Os Sacrum, and to the neighbouring lateral parts of that Bone; and laſtly, to the external Labium of the poſterior part of the Criſta Oſſis Ilium, all the way to the great Tuberoſity. The Aponeuroſis covers and adheres very cloſely to the lower part of the Longiſſimus Dorſi, and where it is fixed to the Os Sacrum it is a little covered by ſome inſertions of the Glutæus Maximus.

682. From thence this Muſcle runs upwards and a little laterally over all the Regio Lumbaris, the Aponeuroſis ſending off from its inſide a Maſs of fleſhy Fibres, which are divided from below upwards, into ſeveral large Faſciculi inſerted in all the Tranſverſe Apophyſes of the Loins.

683. Afterwards it runs up obliquely over all the Ribs, ſometimes as high as the two or three loweſt Vertebræ of the Neck, ſometimes higher, and ſometimes it ends at the firſt Vertebra of the Back.

684. Through all this extent the ſide of the Muſcle next the Longiſſimus Dorſi or Vertebræ, is very even, but that next the Ribs is divided into ſeveral Portions in an oblique Diſpoſition from below upwards, reſembling in ſome meaſure the Branch of a Palm-Tree. Theſe Portions, or Digitations are fixed in the Tranſverſe Apophyſes of the Neck, in the Tuberoſity of the firſt Rib, in the lower part of the angular Impreſſions of the ten following Ribs, and near the Extremity of the laſt Rib.

685. This Digitation belonging to the laſt Rib is broad and more fleſhy than Tendinous. Thoſe of the other Ribs are Tendinous, flat and narrow, and thoſe of the Neck are ſomething fleſhy, but very ſlender. The moſt ſuperior Portions are longer and narrower than thoſe below them, they growing gradually ſhorter and broader as they deſcend.

686. In diſſecting this Muſcle with care, between theſe Portions and the Ribs, we meet with ſeveral long thin Muſcular Faſciculi, which croſſing the Portions and adhering to them, are afterwards fixed in the Ribs above and behind the Inſertions of the ſeveral Portions.

687. These Muſcular Faſciculi begin at the Tranſverſe Apophyſes of the ſame Vertebræ of the Neck, from whence they run down and are fixed in the eight or nine following Ribs. Sometimes they paſs over ſeveral Ribs without being inſerted in them; but this varies in different Subjects, and ſometimes in the two ſides of the ſame Subject.

688. In this manner theſe Faſciculi form a particular Plane, which ſome take for the internal Portion of the Sacro-Lumbaris; others, after *Steno*, call

it Muſculus Acceſſorius Sacro-Lumbaris. Some take it it for a diſtinct Muſcle, calling it the Cervicalis Deſcendens of *Diemerbroek.* I have already mentioned it among the Muſcles which move the Vertebræ of the Neck, by the Name of Tranſverſalis Gracilis Colli.

### § 8. *Longiſſimus Dorſi.*

*Situation in general.* 689. This is a very Complex, long and narrow Muſcle, ſomething like the Sacro-Lumbaris, but more fleſhy and thicker, ſituated between the Spinal Apophyſes and the Muſcle juſt mentioned, from which it is divided by a ſmall, fatty or cellular Line, but at the lower part they are confounded together. It covers the Semi-Spinalis or Tranſverſo-Spinalis Dorſi and the Semi-Spinalis Lumborum. Its upper part lies between the Sacro-Lumbaris and Tranſverſalis-Colli.

*Inſertions.* 690. Its inferior Inſertions are partly by diſtinct Tendinous Portions, and by a broad Aponeuroſis common to it with the Sacro-Lumbaris, and partly by large Faſciculi of fleſhy Fibres, which at firſt Sight ſeem to compoſe one uniform Maſs. It is fixed by the long, flat, Tendinous Portions of different breadths, to the laſt Spinal Apophyſis of the Back, to all thoſe of the Loins, and to one or two of the ſuperior Spines of the Os Sacrum. Theſe Portions lie at different diſtances from each other, but are all connected by a thin Aponeuroſis fixed to their Edges.

691. From thence they run obliquely, diverging from the Apophyſes, and beginning to be fleſhy at their inner or anterior ſides, they terminate above in ſmall roundiſh Tendons, inſerted in the Extremities of the ſeven upper Tranſverſe Apophyſes of the Back, and in the neighbouring Ligaments of all the true Ribs. Sometimes one Inſertion in the Vertebræ of the Back is wanting, and ſometimes there is one in the Tranſverſe Apophyſis of the laſt Vertebra of the Neck.

692. The other inferior Inſertion wholly fleſhy, is partly in the inner or foreſide of the Aponeuroſis of the Sacro-Lumbaris, and partly in the upper Portion of the Os Sacrum, being from thence continued to the great Tuberoſity of the Os Ilium, ſo that the Aponeuroſis of the Sacro-Lumbaris ſeems to afford a third Inſertion to the Longiſſimus Dorſi.

693. From thence this uniform Maſs of fleſhy Fibres runs up in a courſe almoſt direct, croſſing the Tendinous Portions which are more oblique; and join the inferior Fibres of the Sacro-Lumbaris by large Faſciculi inſerted in the tranſverſe and oblique Apophyſes of the Vertebræ of the Loins. The Fibres of this Portion go afterwards to the Ribs, being inſerted by Planes more or leſs fleſhy in the lower convex Edge of all the falſe Ribs, between the Condyles or Tuberoſities and the Angles.

694. At the ſixth or ſeventh Vertebra of the Back, one or more of the Tendinous Portions often communicate with ſome Faſciculi of the Semi-Spinalis or Tranſverſo-Spinalis Dorſi.

695. By this Deſcription we ſee that the Longiſſimus Dorſi is in part a great Semi-Spinalis Divergens or Spino-Tranſverſalis, much in the ſame manner as the inferior Portion of the Splenius.

696. In examining the Dorſal Inſertions of this Muſcle, we meet with ſeveral Muſcular Faſciculi which croſs the Tendinous Portions near the Spine, but without adhering ſo ſtrongly to them as thoſe already mentioned do to the Sacro-Lumbaris, which they reſemble in every other circumſtance. Theſe Faſciculi are fixed above, to the Tranſverſe Apophyſes of the three or four firſt Vertebræ of the Back, and below to thoſe of the ſixth and ſeventh.

697. I have obſerved other ſuch Faſciculi fixed in the Tranſverſe Apophyſes of the Back from the firſt to the ninth incluſively, and ſituated between the Extremities of the Tranſverſalis Major Colli, and of the Longiſſimus Dorſi with which they communicate at the third Vertebra or thereabouts.

698. These Faſciculi might be reckoned a Muſculus Acceſſorius Longiſſimi Dorſi, or a Tranſverſalis Dorſi, in the ſame manner as that of the Sacro-Lumbaris already mentioned.

699. Some Anatomiſts imagine that the Longiſſimus Dorſi is continued all the way to the Apophyſis Maſtoidæa of the Cranium, taking the Complexus Minor or Maſtoidæus Lateralis to be a Portion of this Muſcle.

700. This Muſcle and the Sacro-Lumbaris are common to the Back and Loins.

## § 9. *Spinalis Dorſi Major.*

701. This is a pretty long and ſlender Muſcle, lying upon the lateral part of the Extremities of the Spinal Apophyſes of the Back. *Situation in general.*

702. It is compoſed of ſeveral Muſcular Faſciculi of different lengths, which croſſing each other, are inſerted laterally by ſmall Tendons in the Spinal Apophyſes from the ſecond, third, or fourth Vertebra of the Back, and ſometimes, though ſeldom, from the laſt of the Neck or firſt of the Back; all the way to the firſt or ſecond Vertebra of the Loins, with ſeveral irregular Decuſſations which vary in different Subjects. *Inſertions.*

703. The longeſt Faſciculi are a little incurvated, becauſe they incloſe the reſt, which are gradually diſpoſed between the long ones and the Spinal Apophyſes; ſo that this Muſcle which terminates by both Extremities in Points, is of ſome conſiderable breadth in the middle.

704. It communicates by ſome Fibres with the Longiſſimus Dorſi and Semi-Spinalis or Tranſverſo-Spinalis; and it ſends off Faſciculi to ſeveral Tranſverſe Apophyſes of the Back from the fourth to the eleventh.

705. It is commonly named Semi-Spinalis, but very improperly, as appears from what has been ſaid about the Vertebral Muſcles in general.

### § 10. *Spinales Dorſi Minores.*

*Diviſion and Inſertions.* 706. These Muſcles are of two kinds. Some go laterally from the Extremity of one Spinal Apophyſis to another; being often mixed with the ſhort Faſciculi of the Spinalis Major. The reſt lie directly between the Extremities of two neighbouring Spinal Apophyſes, being ſeparated from their Fellows on the other ſide, by the Spinal Ligament. They are ſmaller and thinner than thoſe of the Neck, and are properly enough termed Inter-Spinales.

### § 11. *Tranſverſalis Dorſi Major.*

707. This Muſcle was deſcribed together with the Longiſſimus Dorſi.

### § 12. *Tranſverſales Dorſi Minores.*

708. I have found ſome particular Muſcles of this kind fixed to the Extremities of the three loweſt Tranſverſe Apophyſes of the Back. The reſt are all in ſome meaſure Continuations of the Tranſverſalis Major; but theſe few which are diſtinct, and which lie in the Interſtice between two Apophyſes, may juſtly enough be termed Inter-Tranſverſales.

### § 13. *Semi-Spinalis ſive Tranſverſo-Spinalis Dorſi.*

*Situation in general.* 709. This is a fleſhy Maſs, which from all the Spinal and Tranſverſe Apophyſes of the Back and Loins, is extended in diſtinct Faſciculi over the Vertebræ themſelves.

*Inſertions.* 710. It is made up like that of the Neck, of ſeveral oblique Converging Vertebral Muſcles, the uppermoſt of which is fixed below to the third Tranſverſe Apophyſis of the Back, and above to the firſt Spinal Apophyſis. The loweſt is fixed below, to the third Tranſverſe Apophyſis of the Loins, and above to the laſt Spinal Apophyſis of the Back.

*Diviſion.* 711. They may be divided into External, which are firſt diſcovered, and Internal, which lie immediately on the Vertebræ. The External from the firſt Vertebra to the ſeventh incluſively, appear to be longer than the Internal, which are covered by them. They may likewiſe be diſtinguiſhed into thoſe which go from one Tranſverſe to ſeveral Spinal Apophyſes, and thoſe which go from ſeveral Tranſverſe to one Spinal Apophyſis.

### § 14. *Tranſverſo-Spinalis Lumborum, Sacer Veteribus.*

*Situation in general.* 712. This Muſcle is compoſed of ſeveral oblique Converging or Tranſverſo-Spinal Muſcles in the ſame manner as in the Back and Neck; and it lies between the Spinal and Oblique Apophyſes of the Loins, reaching to the Os Sacrum.

713. The loweſt of theſe Muſcles are fixed to the ſuperior lateral parts of the Os Sacrum, to the Ligamentum Sacro-Iliacum, and to the poſterior ſuperior Spine of the Os Ilium. The reſt are fixed to the three loweſt Tranſverſe Apophyſes, and to the four loweſt Oblique Apophyſes of the Loins, and to their lateral Tuberoſities. From thence they run up to all the Spinal Apophyſes of theſe Vertebræ, the External or thoſe that appear firſt, being longer than the Internal which lie immediately on the Vertebræ, eſpecially toward the lower part.

### § 15. *Spinales & Tranſverſales Lumborum.*

714. There are ſome Faſciculi which run up from the ſuperior falſe Spines of the Os Sacrum, to the lower Spinal Apophyſes of the Loins, which may be looked upon as ſo many Spinales Lumborum Majores. There are likewiſe ſome Spinales Minores between the Spinal Apophyſes of the Loins, and Tranſverſales Minores between the Tranſverſe Apophyſes, which are ſometimes of a conſiderable breadth.

### § 16. *Quadratus Lumborum ſive Lumbaris Externus.*

*Situation in general.* 715. This is a ſmall, oblong, flat Muſcle, irregularly ſquare, narrower at its upper than at its lower part, lying along the ſides of the Vertebræ Lumborum between the laſt falſe Rib and the Os Ilium.

*Inſertions.* 716. It is fixed below to the external Labium of almoſt all the poſterior half of the Criſta Oſſis Ilium, to the Ligamentum Sacro-Iliacum, and a little to the Os Sacrum, by a fleſhy Plane, the Fibres whereof run obliquely backward.

717. From thence it runs up between the Sacro-Lumbaris and Pſoas, by both which it is partly hid, and is inſerted in the Extremities of all the Tranſverſe Apophyſes of the Loins by oblique Tendinous Digitations. It is likewiſe fixed by a broad Inſertion in the twelfth Rib, on the inſide of the Ligament that lies between it and the Longiſſimus Dorſi, by which that Rib is connected to the firſt Vertebra of the Loins.

718. I have obſerved likewiſe a ſmall Lumbaris Externus adhering very cloſely to the backſide of the Quadratus, and fixed by Tendinous Digitations to the Extremities of the ſecond, third and fourth Tranſverſe Apophyſes of the Loins. From thence its fleſhy Fibres run up obliquely over the Quadratus, and then mix with it at its Inſertion in the laſt falſe Rib.

### § 17. *Muſculi Oſſis Coccygis.*

719. These are ſmall, thin, radiated Muſcles lying on the inner or concave ſide of the Os Sacrum, and neighbouring parts of the Pelvis. They are four in number, two on each ſide, whereof one is placed more forward, the other more backward; for which reaſon the firſt may be termed Coc-

cygæus Anterior ſive Iſchio-Coccygæus; the other Coccygæus Poſterior ſive Sacro-Coccygæus.

720. The Coccygæus Anterior is fixed by a broad Inſertion in the Anterior Portion of the ſmall Tranſverſe Ligament at the upper part of the Foramen Ovale of the Os Innominatum, which, as was obſerved in the Deſcription of the freſh Bones, is no more than a particular Fold of the great Tranſverſe Ligament of the Pelvis. From thence it runs between this great Ligament and the Muſculus Obturator Internus, with which it is often confounded by Anatomiſts, and contracting in breadth, it is inſerted in the lower part of the Os Coccygis.

721. The Coccygæus Poſterior or Sacro-Coccygæus is fixed to the inner or concave Edge of the two firſt Vertebræ of the Os Sacrum, to the inner and lower Edge of the Ligamentum Sacro-Sciaticum, and to the Spine of the Os Iſchium. From thence contracting in breadth, it is inſerted in the inſide of the Os Coccygis above the former Muſcle.

### § 18. *Pſoas Parvus.*

*Situation.* 722. This is a long ſlender Muſcle lying upon the Pſoas Major. It is ſometimes wanting, and *Riolan* who met with it often in Men, takes notice of his having found it once in a Woman, as a thing very extraordinary. As for my own part I found it ſeveral times in Women before I ever met with it in Men, and I ſtill continue to obſerve it moſt frequently in that Sex.

723. It is fixed above by a ſhort Tendon, ſometimes to the laſt Tranſverſe Apophyſis of the Back, or higher; ſometimes to the firſt of the Loins, and ſometimes to both. From thence it runs down wholly fleſhy, and more or leſs complex, on the great Pſoas in a Direction a little oblique.

724. Having reached the middle of the Regio Lumbaris or thereabouts, it forms a ſlender flat Tendon, which gradually increaſing in breadth, like a thin Aponeuroſis, runs over the Pſoas Major and Iliacus Internus at their Union, and from thence down to the Symphyſis of the Os Pubis and Os Ilium, and is inſerted chiefly in the Criſta of the Os Pubis above the Inſertion of the Pectineus, ſometimes ſending an Aponeurotic Lamina further down.

725. Besides this Pſoas Parvus, there is another ſtill ſmaller, between it and the Vertebræ, inſerted much in the ſame manner. This Muſcle I diſcovered in the Year 1713.

ART.

## ART. XVII.

### *The Muſcles which move the Lower Jaw.*

726. THESE Muſcles are ten in number, five on each ſide, viz.

1. *Maſſeter.*
2. *Temporalis.*
3. *Pterygoidæus Major ſive Internus.*
4. *Pterygoidæus Minor ſive Externus.*
5. *Digaſtricus.*

727. To theſe ſome add the two Muſculi Cutanei; but very improperly, for a reaſon which ſhall be given in another place.

### § 1. *Maſſeter.*

728. THIS is a very thick fleſhy Muſcle, ſituated at the back part of the Cheek. It ſeems to be made up of three Portions, like a Triceps, viz. one large and external Portion, one middle, and one ſmall and internal. *Situation.*

729. THE External Portion is fixed by one Tendinous Extremity to all the Inferior Edge of the Os Malæ, and a little to the neighbouring parts of the Os Maxillare and Apophyſis Zygomatica of the Os Temporum. From thence it runs down obliquely backward, being wholly fleſhy, and is inſerted by the other Extremity in the rough Impreſſion on the outſide of the Angle of the Lower Jaw.

730. THE Middle Portion is fixed by one end to the lower Edge of the whole Apophyſis Zygomatica of the Os Temporum, and a very little to that of the Os Malæ. From thence it runs down a little obliquely forward in an oppoſite Direction to the firſt Portion, under which it croſſes; and is inſerted by its other Extremity in the middle of the inſide of the Ramus of the Lower Jaw, near the Inſertion of the External Portion, with which it mixes.

731. THE third Portion which is leaſt and moſt internal, is fixed by one Extremity to the inner Labium of the lower Edge, and alſo to the inſide of almoſt all the Zygomatic Arch; and by the other, to the Root or Baſis of the Coronoide Apophyſis, where it mixes wholly fleſhy with the Inſertion of the middle Portion. This third Portion, by its nearneſs of Situation, ſeems ſometimes to be an Appendix of the Temporal Muſcle.

### § 2. *Temporalis.*

732. THIS is a broad flat Muſcle, reſembling the Quadrant of a Circle in Figure. It occupies all the Semi-Circular or Semi-Oval Plane of the lateral Region of the Cranium, the Temporal Foſſa and part of the Zy- *Situation in general.*

gomatic Foſſa: From this Situation it has its name, and likewiſe that of Crotaphites, which is ſometimes given to it.

*Inſertions.* 733. To conceive juſtly the Inſertions of this Muſcle, it muſt be obſerved, that through all the Circumference of the Semi-Circular Plane already mentioned, the Pericranium is divided into two Laminæ. The Internal Lamina ſometimes taken for a particular Perioſteum, covers immediately all the bony parts of this Region. The External Lamina ſeparated from the other, is ſpread out like an Aponeurotic or Ligamentary Tent, by means of its Adheſions to the external Angular Apophyſis of the Os Frontis, to the poſterior Edge of the ſuperior Apophyſis of the Os Malæ, and to the upper Edge of all the Zygomatic Arch, all the way to the Root of the Maſtoide Apophyſis.

*Diviſion.* 734. This Muſcle is compoſed of two Planes of fleſhy Fibres, fixed to the two ſides of a Tendinous Plane nearly of the ſame breadth with them, by which they are ſeparated, it being ſpread quite through the Muſcle like a concealed middle Tendon; as may be plainly ſeen by dividing the Muſcle all the way to the Bone, according to the Direction of its Fibres. The Body of the Muſcle thus formed is incloſed between the two Aponeurotic or Ligamentary Laminæ in the following manner.

735. The Internal fleſhy Plane is fixed by a broad radiated Inſertion, to all the Semi-Circular Plane of the Cranium, by the Intervention of the Internal Lamina of the Perioſteum.

736. Thus it is fixed to the lateral external part of the Os Frontis, and to its external Angular Apophyſis, to the lower part of the Os Parietale, to the Squammous Portion of the Os Temporis, to the great Ala or Temporal Apophyſis of the Sphenoidal Bone, by which the Temporal Foſſa is formed; and a little to the backſide of the internal Orbitary Apophyſis of the Os Malæ which forms part of the Zygomatic Foſſa.

737. Through all this Space the fleſhy Fibres contract gradually, by means of their Adheſions to the Tendinous Plane, which diminiſhes in breadth and increaſes in thickneſs in proportion as it deſcends.

738. The external fleſhy Plane is fixed in the ſame radiated manner to the inſide of the external Lamina of the Pericranium, from the great Semi-Circular Circumference, all the way to a ſmall Portion of this Lamina more or leſs Semi-Circular, above its Inſertion in the Zygomatic Arch. Here the fleſhy Fibres leave the external Lamina, and the void Space thus formed between the ſmall Semi-Circular Portion, and the fleſhy Fibres, is commonly filled with Fat.

739. Through the whole extent of this Inſertion the fleſhy Fibres gradually contract, and adhere to the outſide of the middle Tendinous Plane in the ſame manner as the internal Plane adheres to the other ſide, but in a contrary Direction.

740. The middle Tendinous Plane continuing to contract by degrees, ends at length in a very conſiderable Tendon, the Extremity whereof, which is in a manner double, incloſes the Coronoide Apophyſis of the Lower Jaw, being ſtrongly inſerted in the Edges and inſide thereof, and

alſo a little in that part of the Bone which lies between the two Apophyſes. The Internal Portion of this Inſertion is thicker, and has more fleſhy Fibres than the External, which is almoſt wholly Tendinous or Aponeurotic.

741. There is another ſmall Plane reckoned by ſome to be a Portion of this Muſcle, which in reality is no more than the third Portion of the Maſſeter, as may eaſily be perceived by ſawing off the Zygomatic Arch at the two ends, and then turning it down; for this ſmall Muſcle parts from the Temporalis without difficulty, and continues to adhere to the Maſſeter.

### § 3. *Pterygoidæus Major ſive Internus.*

742. This Muſcle lies on the inſide of the Lower Jaw almoſt in the ſame manner as the Maſſeter does on the outſide, being of the ſame Figure with that Muſcle, only ſmaller and narrower. *Situation in general.*

743. It is fixed above in the Pterygoide Cavity, chiefly to the inſide of the external Ala of the Apophyſis Pterygoides. This Inſertion is wholly fleſhy, and from thence the Muſcle has its name. *Inſertions.*

744. It runs down obliquely toward the Angle of the Lower Jaw, and is inſerted a little Tendinous in the Inequalities on the inſide thereof, oppoſite to the Inſertion of the Maſſeter. It might be called Maſſeter Internus.

### § 4. *Pterygoidæus Minor ſive Externus.*

745. This is an oblong fleſhy Muſcle, much ſmaller than the other, and ſituated almoſt Horizontally between the outſide of the Apophyſis Pterygoides, and the Condyloide Apophyſis of the Lower Jaw, the Subject being conſidered in an erect Poſture. *Situation in general.*

746. It is fixed by one Extremity to the Outſide and Edge of the outer Ala of the Pterygoide Apophyſis, filling the Foſſula which is at the Baſis of this Apophyſis, near the Baſis of the Temporal Apophyſis of the Sphenoidal Bone.

747. From thence it runs backward and a little outward, into the void Space between the two Apophyſes of the Lower Jaw, and is inſerted Anteriourly in the Condyloide Apophyſis at a ſmall Foſſula immediately under the inner Angle of the Condyle. It is alſo fixed to the Capſular Ligament of the Joint.

### § 5. *Digaſtricus.*

748. This is a ſmall long Muſcle ſituated laterally between the whole Baſis of the Jaw and the Throat. It is fleſhy at both Extremities and Tendinous in the middle, as if it conſiſted of two ſmall Muſcles joined endwiſe by a Tendon, and from thence it is called Digaſtricus in Greek and Biventer in Latin. *Situation in general.*

*Inſertions.* 749. It is fixed by one fleſhy Extremity in the Sulcus of the Maſtoide Apophyſis. From thence it runs forward, inclining towards the Os Hyoides, where the firſt fleſhy Body ends in a round Tendon, which is connected to the lateral Part and Root of the Cornua of that Bone by a kind of Aponeurotic Ligament, and not by a Vagina or Pulley, as appears at firſt ſight, becauſe of its paſſage by the Extremity of the Muſculus Stylogloſſus, of which hereafter.

750. Here the Tendon is incurvated and preſently ends in the other fleſhy Body, which is fixed immediately above the internal Labium of the Baſis of the Chin near the Symphyſis, in a ſmall unequal Depreſſion. This Inſertion is broader than that of the other Extremity. Sometimes the Anterior Inſertions of the two Digaſtrici touch each other, and ſometimes ſeveral of their Fibres croſs each other conſiderably.

## ART. XVIII.

### *The Muſcles which move the Os Hyoides.*

751. These Muſcles are nine in number, one Anterior without a fellow, and eight Lateral diſpoſed in four Parts, viz.

1. *Mylo-Hyoidæus.*
2. *Genio-Hyoidæus.*
3. *Stylo-Hyoidæus.*
4. *Omoplato-Hyoidæus.*
5. *Sterno-Hyoidæus.*

752. These names are borrowed from the Greek, and expreſs the Parts in which the Muſcles are inſerted.

753. The Os Hyoides is likewiſe moved by the Digaſtricus of the Lower Jaw; and it may in certain circumſtances be moved a little by ſome other Muſcles, of which hereafter.

### § 1. *Mylo-Hyoidæus.*

*Situation in general.* 754. This is a broad, thin, penniform Muſcle, ſituated tranſverſely between the internal lateral parts of the Baſis of the Lower Jaw, and lying on the Anterior Portions of the two Digaſtric Muſcles.

*Structure and Inſertions.* 755. It is made up of two equal fleſhy Portions, one lying on the right ſide, the other on the left, both in the ſame Plane, and joined to a ſmall middle Tendon, which is inſerted Anteriourly in the middle of the Baſis of the Os Hyoides, and from thence runs directly forward, diminiſhing gradually in its courſe. This is therefore a true Digaſtric Muſcle and cannot be divided into two.

756. Each Portion is fixed by fleſhy Fibres to the internal lateral part of the Lower Jaw, between the oblique prominent Line and the Baſis, under the firſt four Dentes Molares, and Caninus. The Anterior and the greateſt

part of the other Fibres of each Portion run obliquely from before backward, to the middle Tendon, in which they are regularly fixed, the Anterior Fibres being the ſhorteſt, and a ſmall triangular void Space being formed between them and the Symphyſis of the Chin.

757. The Poſterior Fibres of each Portion which make about a fourth part of the whole, run likewiſe on each ſide to the Baſis of the Os Hyoides, and are inſerted along the lower Edge of its anterior or convex ſide, and from thence a little upward.

## § 2. *Genio-Hyoidæus.*

758. This is a ſmall and pretty long fleſhy Muſcle, ſituated between the Symphyſis of the Chin and the Os Hyoides, cloſe by its fellow. *Situation in general.*

759. It is fixed by its anterior Extremity to a rough and ſometimes prominent Surface, on the inner or poſterior ſide of the Symphyſis of the Lower Jaw, a little above the Chin. From thence it runs backward, and is inſerted anteriourly in the upper Edge of the Baſis of the Os Hyoides, having firſt ſent off a ſmall lateral Portion which is fixed a little higher to the Root of the Cornu. *Inſertions.*

760. This Portion is diſtinguiſhed from the reſt by a Nerve of the ninth Pair; and it makes the Muſcle appear a little oblique. The two Genio-Hyoidæi lie very cloſe together, except at their upper Edge, where they are a little ſeparated, but every where elſe they look as if they were but one Muſcle.

## § 3. *Stylo-Hyoidæus.*

761. This is a ſmall fleſhy Muſcle lying obliquely between the Apophyſis Styloides and Os Hyoides. *Situation in general.*

762. It is fixed laterally by one Extremity to the Root or Baſis of the Apophyſis Styloides, and by the other to the Os Hyoides, at the place where the Baſis and Cornu unite, and likewiſe to the Cornu itſelf, from whence it has been called Stylo-Cerato-Hyoidæus. *Inſertions.*

763. The fleſhy Fibres of this Extremity are often parted, and incloſe the middle Tendon of the Digaſtricus.

## § 4. *Omoplato-Hyoidæus ſive Omo-Hyoidæus vulgo Coraco-Hyoidæus.*

764. This is a very long, ſmall Muſcle, much narrower than the Sterno-Hyoidæus, and ſituated obliquely on the ſide of the Neck or Throat, between the Scapula and Os Hyoides. It is a Digaſtric Muſcle, being divided into two fleſhy Portions joined endwiſe to a ſhort middle Tendon. *Situation in general.*

765. It is commonly fixed by the lower Extremity, to the ſuperior Coſta of the Scapula, between the ſmall Notch and the Angle, and ſometimes very near the Angle, and from thence ſome Anatomiſts have given it the barbarous Name of Coſto-Hyoidæus. *Inſertions.*

766. From thence it paſſes over the Coracoide Apophyſis, adhering ſometimes to it by a kind of Aponeuroſis or Membranous Ligament, and from this Adheſion the name of Coraco-Hyoidæus was given it by ſome who had not diſcovered its main Inſertion.

767. It is likewiſe often fixed to the Clavicula by Ligamentary or fleſhy Fibres; and I have ſometimes ſeen it inſerted in the whole middle Portion of that Bone, being inſeparably united with the Sterno-Hyoidæus. In one Subject I found it to be a kind of Biceps, one Portion of it being fixed to the Angle of the Scapula, the other to the Extremity of the Clavicula.

768. Having paſſed the Clavicle it is bent forward, and runs between the Sterno-Maſtoidæus, and internal Jugular Vein, the ſmall middle Tendon being ſituated in this Place. From thence it runs up to its Inſertion in the inferior lateral part of the Baſis of the Os Hyoides, near the Cornu, and Inſertion of the Sterno-Hyoidæus which it covers a little.

## § 5. *Sterno-Hyoidæus ſive Sterno-Cleido-Hyoidæus.*

*Situation in general.* 769. This is a long, thin, flat Muſcle, broader at the lower than at the upper part, and ſituated together with its fellow, on the foreſide of the Throat, from whence ſome have very improperly termed it Muſculus Bronchialis.

*Inſertions.* 770. It is fixed by its lower Extremity, in the ſuperior and lateral part of the inner or poſterior ſide of the Sternum, in the poſterior part of the Sternal Extremity of the Clavicula, in the tranſverſe Ligament which connects theſe two Bones, and in the inner or backſide of the Cartilage of the firſt Rib. All theſe other Inſertions are more conſiderable than that in the Sternum, which is ſometimes ſcarce perceivable.

771. From thence it runs up on the foreſide of the Aſpera Arteria, joined to its fellow by a Membrane which forms a ſort of Linea Alba, and is inſerted laterally in the lower Edge of the Baſis of the Os Hyoides.

772. There is ſometimes a tranſverſe Tendinous Line about the middle of the backſide of this Muſcle.

773. According to the Method commonly obſerved in compleat Treatiſes of Myology, the following Muſcles remain ſtill to be deſcribed, viz. The Muſcles of the Forehead, Occiput, Palpebræ, Eye, External Ear, Noſe, Lips, Tongue, Uvula, Ductus Euſtachianus, Pharynx, Larynx, Parts of Generation, Anus and Bladder; and to theſe we ought even to add the Heart, as Mr. *Cowper* has done in the late Edition of his Myotomy.

774. This Method may be followed in Treatiſes on the Muſcles alone, in which all the Parts that have any relation to them, are ſuppoſed to be known. But in a compleat Syſtem of Anatomy, it is neither proper for Beginners, nor even for thoſe who believe they have made a conſiderable progreſs in this Science. For ſuch a Treatiſe of all the Muſcles of the Body, muſt be placed either before the Deſcription of the Viſcera and other particular Organs, or after it.

775. If it goes before, we muſt be obliged to ſpeak of many Parts altogether unknown, and thereby occaſion falſe Ideas and dangerous Miſtakes. If it comes after, the inconveniency will be equally great, it being impoſſible to give any true Idea of many of the Viſcera without a previous knowledge of the Muſcles that lie near them; neither can the Learner be made acquainted with theſe Muſcles, till he knows the Bones, Cartilages, &c. which ſuſtain and ſurround them, as we ſhall ſee afterwards.

776. It may be objected, that I have here deſcribed the Palmaris Brevis which is inſerted in no Bone, and that I have omitted the Muſcles of the Bones of the Ears, which are intirely fixed in Bones. I have already anſwered the firſt Objection, and the ſecond ſhall be anſwered in the proper place.

## ART. XIX.

*A Compendious View of all the Muſcles which are wholly inſerted in Bones; with an Enumeration of the Bones in which each Muſcle is inſerted.*

### 1. *Obliquus Externus.*

*Muſcles of the Abdomen.*

THE fifth, ſixth, and ſeventh true Ribs; ſeldom the fourth. All the falſe Ribs. The Os Ilium. The Os Pubis.

### 2. *Obliquus Internus.*

The ſixth and ſeventh true Ribs and their Cartilages. All the falſe Ribs and their Cartilages. The laſt Vertebra of the Loins. The Os Ilium. The Os Pubis.

### 3. *Tranſverſalis.*

The Cartilages of the ſixth and ſeventh true Ribs. The Cartilages of all the falſe Ribs. The three firſt Vertebræ of the Loins.

### 4. *Rectus.*

The Extremity of the Body or ſecond Bone of the Sternum. The Cartilages of the fifth, ſixth and ſeventh true Ribs. The Cartilage of the firſt falſe Rib. The Os Pubis.

### 5. *Pyramidalis.*

The Os Pubis.

### 6. *Trapezius.*

*Muſcles which move the Bones of the Shoulder on the Trunk.*

THE Os Occipitis. The Spinal Apophyſes of all the Vertebræ of the Neck. The Spinal Apophyſes of all the Vertebræ of the Back. The Scapula; its Spine and Acromium. The Clavicle; its Humeral Portion.

### 7. *Rhomboides.*

THE two or three loweſt Vertebræ of the Neck; their Spinal Apophyſes. The three or four upper Vertebræ of the Back; their Spinal Apophyſes. The Scapula; the Sub-Spinal Portion of the Baſis.

### 8. *Angularis vulgo Levator Proprius.*

THE Tranſverſe Apophyſes of the four firſt Vertebræ of the Neck. The Scapula; the ſuperior Angle and Supra-Spinal Portion of the Baſis.

### 9. *Pectoralis Minor.*

THE ſecond, third, fourth and fifth true Ribs. The Scapula; the Coracoide Apophyſis.

### 10. *Serratus Major.*

THE Scapula; the whole Baſis. All the true Ribs. Sometimes one or two of the falſe Ribs.

### 11. *Subclavius.*

THE firſt Rib and its Cartilage. The middle and Sternal Portions of the Clavicula.

### 12. *Deltoides.*

*Muſcles which move the Os Humeri on the Scapula.*

THE Scapula; the Spine and Acromium. The Clavicula. The Os Humeri, under the Channel of the Biceps.

### 13. *Pectoralis Major.*

THE Clavicula near the Sternum. The Sternum. All the true Ribs. The firſt falſe Rib and ſometimes the ſecond. The Os Humeri, below the middle of the Channel of the Biceps.

### 14. *Latiſſimus Dorſi.*

The ſix, ſeven and ſometimes eight lower Vertebræ of the Back; the Spinal Apophyſes. All the Vertebræ of the Loins; the Spinal Apophyſes. The Os Sacrum. The Os Ilium. The four loweſt falſe Ribs. The Scapula; the inferior Angle. The Os Humeri, near the upper part of the Channel of the Biceps.

### 15. *Teres Major.*

The Scapula; the inferior Angle. The Os Humeri; about the middle of the Channel of the Biceps.

### 16. *Teres Minor.*

The Scapula; the inferior Coſta. The Os Humeri; the inferior Surface of the great Tuberoſity of the Head.

### 17. *Infra-Spinatus.*

The Scapula; the Sub-Spinal Cavity or Foſſa. The Os Humeri; the middle part of the Head.

### 18. *Supra-Spinatus.*

The Scapula, the Supra-Spinal Cavity or Foſſa. The Os Humeri; the ſuperior part of the Head.

### 19. *Subſcapularis.*

The inſide of the Scapula. The Os Humeri; the ſmall Tuberoſity of the Head.

### 20. *Coraco-Brachialis.*

The Coracoide Apophyſis of the Scapula. The Os Humeri; the middle Portion.

### 21. *Biceps.*

*Muſcles which move the Fore-Arm upon the Os Humeri.*

The Scapula; above the Glenoide Cavity, and at the Coracoide Apophyſis. The Radius; at the Tuberoſity.

### 22. *Brachialis.*

THE Os Humeri; below the Inſertion of the Deltoides. The Ulna; below the Coronoide Apophyſis.

### 23. *Anconæus Major.*

THE Scapula; at the lower part of the Neck. The Ulna; at the top of the Olecranum.

### 24. *Anconæus Externus.*

THE Os Humeri; below the great Tuberoſity of the Head. The Ulna; at the Olecranum.

### 25. *Anconæus Internus.*

THE Os Humeri; above the middle. The Ulna; at the Olecranum.

### 26. *Anconæus Minor.*

THE Os Humeri; at the External Condyle. The Ulna; the external oblong Foſſula of the Head.

### 27. *Supinator Longus.*

*Muſcles which move the Radius on the Ulna.*

THE Os Humeri at the Criſta of the external Condyle. The Radius; near the Styloide Apophyſis.

### 28. *Supinator Brevis.*

THE Os Humeri; at the lower part of the external Condyle. The Radius; the upper Quarter of its inſide.

### 29. *Pronator Teres.*

THE Os Humeri; at the internal Condyle. The Radius; at the middle convex Portion.

### 30. *Pronator Quadratus.*

THE Ulna; at the long Eminence of the lower Extremity. The Radius; at the broad Surface of the lower Extremity.

*Muſcles which move the Carpus on the Fore Arm.*

### 31. *Ulnaris Internus.*

The Os Humeri; at the internal Condyle. The Ulna; at the Olecranum, and almoſt the upper half of the Bone. The Os Piſiforme. The Os Unciforme.

### 32. *Radialis Internus.*

The Os Humeri; at the inner Condyle. The firſt Bone of the Metacarpus, and ſometimes the ſecond. The firſt Phalanx of the Thumb.

### 33. *Ulnaris Externus.*

The Os Humeri; at the outer Condyle. The fourth and ſometimes the third Bone of the Metacarpus. The firſt Phalanx of the Little Finger; at the Baſis.

### 34. *Radialis Externus Primus & Secundus.*

The Os Humeri; at the outer Condyle. The firſt and ſecond Bones of the Metacarpus.

### 35. *Ulnaris Gracilis vulgo Palmaris Longus.*

The Os Humeri; at the inner Condyle. The Os Scaphoides; ſometimes immediately; but moſt commonly by the Intervention of the great Annular Ligament.

### 36. *Palmaris Cutaneus.*

The Aponeuroſis Palmaris; but in no Bone.

*Muſcles which move the Metacarpus.*

### 37. *Metacarpius.*

The Os Piſiforme. The fourth Metacarpal Bone.

*Muſcles which move the Fingers.*

### 38. *Flexor Pollicis Longus.*

The Radius; the inſide. The third Phalanx of the Thumb.

### 39. *Extenſor Pollicis Primus.*

The Ulna; the outſide near the Head. The Radius; the middle Portion of its outſide. The firſt and ſecond Phalanges of the Thumb.

### 40. *Extenſor Pollicis Secundus.*

The Ulna; the Outſide, nearer the Middle than the Head. The Radius; the Outſide, between the Middle and the lower Extremity. The third Phalanx of the Thumb.

### 41. *Thenar.*

The Os Trapezium. The Head of the firſt, and the Baſis of the ſecond Phalanx of the Thumb.

### 42. *Meſothenar.*

The firſt Metacarpal Bone; the Body. The ſecond Metacarpal Bone, near the Head. The Head of the firſt, and the Baſis of the ſecond Phalanx of the Thumb.

### 43. *Antithenar.*

The firſt Bone of the Metacarpus; near the Baſis. The firſt Phalanx of the Thumb near the Head.

### 44. *Perforatus.*

The Ulna; near the Head, and the Inſide. The Radius, in the ſame manner. The ſecond Phalanges of the four Fingers; the flat ſides.

### 45. *Perforans.*

The Ulna; the Inſide, from the Head to the lower third part of the Bone. The third Phalanges of the four Fingers; the flat ſides.

### 46. *Extenſor Digitorum.*

The Os Humeri; the external Condyle. The Radius; ſometimes a little. The firſt and third Phalanges of the four Fingers; the convex ſides.

### 47. *Extenſor Indicis proprius.*

The Ulna; the Inſide, between the middle and the lower Extremity. The firſt and third Phalanx of the Index; the convex ſide.

### 48. *Extenſor Minimi Digiti Proprius.*

The upper half of the Ulna; the inſide. The Phalanges of the Little Finger; the convex ſides.

### 49. *Lumbricales.*

The Tendons of the Perforatus. The firſt and third Phalanges; the convex ſides.

### 50. *Interoſſei Externi.*

The Bones of the Metacarpus; near their convex ſides. The firſt and third Phalanges; the convex ſides.

### 51. *Interoſſei Interni.*

The Bones of the Metacarpus; the outer and inner ſides. The firſt and third Phalanges.

### 52. *Semi-Interoſſeus Indicis.*

The firſt Phalanx of the Thumb; the outſide of the Baſis. The Os Trapezium. The firſt Phalanx of the Index; near the Head.

### 53. *Hypothenar Minor.*

The Os Piſiforme. The firſt Phalanx of the Little Finger.

### 54. *Pſoas ſive Lumbaris Internus.*

*Muſcles which move the Os Femoris on the Pelvis.*

The laſt Vertebra of the Back; the Body and tranſverſe Apophyſis. All the Vertebræ of the Loins; in the ſame manner. The Os Femoris; the little Trochanter.

### 55. *Iliacus.*

The Os Ilium; the Criſta, Anterior Spines, the Space between theſe, and the inſide of the Bone. The Os Sacrum; the part of its concave ſide neareſt the Os Ilium. The Os Femoris; the Trochanter Minor.

### 56. *Pectineus.*

The Os Pubis; the Criſta; the Os Femoris; below the little Trochanter.

### 57. *Glutæus Maximus.*

The Os Ilium; the Criſta and Tuberoſity. The Os Sacrum; the lateral part of the convex ſide. The Os Coccygis; in the ſame manner. The Os Femoris; the long Impreſſion below the great Trochanter.

### 58. *Glutæus Minimus.*

The Os Ilium; the outſide, between the great and ſmall Semi-Circular Impreſſions. The Os Iſchium; the Spine. The Os Femoris; the upper part of the Trochanter Major.

### 59. *Triceps Primus.*

The Os Pubis; the Tuberoſity or Spine, and the Symphyſis. The Os Femoris; the middle part of the Linea Aſpera.

### 60. *Triceps Secundus.*

The Os Pubis; the inferior Ramus. The Os Femoris; the upper part of the Linea Aſpera.

### 61. *Triceps Tertius.*

The Os Iſchium; the ſmall Ramus, and the Tuberoſity. The Os Femoris; the middle part of the Linea Aſpera, and ſomething more, and the Tuberoſity of the inner Condyle.

### 62. *Pyriformis.*

The Os Ilium; the Poſterior Sinus. The Os Sacrum, the lateral part. The Os Femoris; the upper part of the great Trochanter.

### 63. *Obturator Internus.*

The Os Ilium. The Os Pubis. The Os Iſchium; the inſides of theſe three Bones, near the Foramen Ovale, and great Sinus. The Os Femoris; near the upper part of the Cavity of the great Trochanter.

### 64. *Gemelli.*

The Os Iſchium; the Spine, Notch and Tuberoſity. The Os Femoris; about the middle of the Cavity of the great Trochanter.

### 65. *Obturator Externus.*

The Os Pubis; the inſide all the way to the Foramen Ovale. The Os Iſchium; the Edge of the Foramen Ovale. The Os Femoris, the middle of the Cavity of the great Trochanter.

### 66. *Quadratus.*

The Os Iſchium; between the Acetabulum and the Tuberoſity. The Os Femoris; the lower half of the oblong Eminence of the Trochanter Major.

### 67. *Muſculus Faſciæ Latæ.*

The Os Ilium; the Superior Anterior Spine. The Os Femoris; below the great Trochanter.

### 68. *Rectus Anterior.*

*Muſcles which move the Leg on the Os Femoris.*

The Os Ilium; the Superior Anterior Spine, and ſuperior part of the Supercilium Acetabuli. The Patella; the upper Edge.

### 69. *Vaſtus Externus.*

The Os Femoris; the poſterior rough Surface of the great Trochanter. The Patella; the outer Edge. The Tibia; the outſide of the Head.

### 70. *Vaſtus Internus.*

The Os Femoris; the anterior rough Surface of the great Trochanter. The Patella; the inſide. The Tibia; the inſide of the Head.

### 71. *Crureus.*

The Os Femoris; along the foreſide. The Patella; the upper Edge.

### 72. *Sartorius.*

The Os Ilium; the ſuperior anterior Spine. The Tibia, the inner and forepart of the Head.

### 73. *Gracilis Internus.*

The Os Pubis; the ſmall Ramus near the Symphyſis. The Tibia; the inner and forepart of the Head, below the Inſertion of the Sartorius.

### 74. *Biceps.*

The Os Iſchium; the poſterior and lower part of the Tuberoſity. The Os Femoris; the lower half of the Linea Aſpera. The Head of the Fibula.

### 75. *Semi-Nervoſus.*

The Os Iſchium; the upper and poſterior part of the Tuberoſity. The Tibia; the inſide of the upper Extremity, below the Inſertion of the Gracilis Internus.

### 76. *Semi-Membranoſus.*

The Os Iſchium; the bony Line between the Acetabulum and the Tuberoſity. The Tibia; the poſterior Impreſſion of the inner Condyle.

### 77. *Popliteus.*

The Os Femoris; the outer Edge of the external Condyle. The Tibia; the oblique Line on the backſide of the Head.

### 78. *Tibialis Anticus.*

*Muſcles which move the Tarſus on the Leg.*

The Tibia; the upper third part of the Criſta, and the upper two thirds of the outer flat ſide. The Os Cuneiforme Majus; the inſide. The firſt Bone of the Metatarſus; the inſide.

### 79. *Peronæus Medius.*

The Fibula; the outer or anterior ſide. The fifth Bone of the Metatarſus; the Tuberoſity of the Baſis.

### 80. *Peronæus Minimus.*

The Fibula; the lower half of the inſide, between the two oblique Lines. The fifth Bone of the Metatarſus, above and near the Baſis.

### 81. *Gaſtrocnemii.*

The Os Femoris; above the Condyles, and behind their lateral Tuberoſities. The Os Calcis; the poſterior Extremity.

### 82. *Soleus.*

The Tibia; the backſide from the ſuperior oblique Line, to the middle of the Bone. The Fibula; more than the upper third part of the backſide. The Os Calcis; the poſterior Extremity.

### 83. *Tibialis Gracilis, vulgo Plantaris.*

The Os Femoris; the outer Edge of the external Condyle. The Os Calcis; the poſterior Extremity, near the inner Edge.

### 84. *Tibialis Poſticus.*

The Tibia; the upper part of the back ſide. The Fibula; the upper half of the internal Angle. The Os Scaphoides; the Tuberoſity or lower part.

### 85. *Peronæus Maximus.*

The Tibia; near its Articulation with the Fibula on the foreſide. The Fibula; the outer and foreſide of the Head and Neck, and the upper half of the external Angle. The Os Cuneiforme Majus; a little toward the lower Part. The firſt Bone of the Metatarſus; the lateral Impreſſion of the Baſis.

### 86. *Extenſor Pollicis Longus.*

The Tibia; near the lower Extremity, toward the Fibula. The Fibula; the upper three fourth Parts. The firſt and ſecond Phalanges of the Great Toe; the Baſes.

*Muſcles which move the Metatarſus and Toes.*

### 87. *Flexor Pollicis Longus.*

The Fibula; the lower half of the backſide. The ſecond Phalanx of the Great Toe; the under ſide.

### 88. *Thenar.*

The Os Calcis; the lower Part. The Os Schaphoides; the lower Part. The Os Cuneiforme Majus; the lower Part. The firſt Phalanx of the Great Toe; the inſide. The internal Seſamoide Bone.

### 89. *Antithenar.*

The ſecond, third and fourth Bones of the Metatarſus; near their Baſes. The firſt Phalanx of the Great Toe; the outſide. The external Seſamoide Bone.

### 90. *Extenſor Digitorum Longus.*

The Tibia; the outſide of the Head. The Fibula; the upper three fourths of the inſide. The four ſmall Toes; along their upper ſides.

### 91. *Extenſor Digitorum Brevis.*

The Aſtragalus; the upper ſide of the anterior Apophyſis. The Phalanx of the Great Toe; the upper ſide. The three following Toes, rarely the fifth; the upper ſides of all the Phalanges.

### 92. *Flexor Digitorum Brevis.*

The Os Calcis; the lower and foreſide of the great Tuberoſity. The ſecond Phalanges of the four Small Toes; the inner part of the under ſide.

### 93. *Flexor Digitorum Longus.*

The Tibia; a little more than the middle third part of the backſide. The third Phalanges of the four Small Toes; the under ſide.

### 94. *Flexor Digitorum Acceſſorius.*

The Os Calcis; the Eminences of the lower ſide.

### 95. *Lumbricales.*

The firſt Phalanges of the Toes, laterally.

### 96. *Tranſverſalis Pedis.*

The laſt three Bones of the Metatarſus; the lower ſides of the Heads, by the Intervention of the Interoſſeus Ligaments. The firſt Phalanx of the Great Toe; the outſide of the Baſis.

### 97. *Interoſſei Superiores.*

The five Bones of the Metatarſus; near their upper ſides. The firſt Phalanx of the ſecond Toe; the outer and inner ſides. The third and fourth Toes; the outſides.

### 98. *Interoſſei Inferiores.*

Four Bones of the Metatarſus; toward the under ſides. The firſt Phalanges of the laſt three Toes; the inſides.

### 99. *Metatarſius.*

The Os Calcis; the great inferior Tuberoſity. The fifth Bone of the Metatarſus; the under ſide.

### 100. *Parathenar Major.*

The Os Calcis; the outer part of the lower ſide. The firſt Phalanx of the Little Toe; the under ſide.

### 101. *Parathenar Minor.*

The fifth Bone of the Metatarſus; the under part of the outſide. The firſt Phalanx of the Little Toe; the under ſide of the Baſis.

### 102. *Diaphragma.*

*Muſcles employed in Reſpiration.*

The Sternum; the Appendix Enſiformis. All the Ribs; their bony Extremities and Cartilages, and almoſt all the laſt falſe Rib. The laſt Vertebra of the Back; the Body. The firſt three or four Vertebræ of the Loins; the Bodies.

### 103. *Scaleni.*

All the Vertebræ of the Neck; the tranſverſe Apophyſes. The firſt two Ribs; the middle and poſterior part of the convex ſide.

### 104. *Serratus Poſticus Superior.*

The laſt two Vertebræ of the Neck; the Spinal Apophyſes. The firſt two Vertebræ of the Back; in the ſame manner. The ſecond, third, fourth, and ſometimes the fifth true Ribs; near the Angles.

### 105. *Serratus Poſticus Inferior.*

The laſt Vertebra of the Back; the Spinal Apophyſis. The firſt three Vertebræ of the Loins; the Spinal Apophyſes. The laſt four falſe Ribs.

### 106. *Intercoſtales.*

All the Ribs and their Cartilages; the Edges.

### 107. *Supra-Coſtales.*

The laſt Vertebra of the Neck; the Tranſverſe Apophyſis. All the Vertebræ of the Back, except the laſt; in the ſame manner. All the Ribs; the poſterior part of the outſide.

### 108. *Sub-Coſtales.*

The true Ribs, from the fourth downward; the concave or inſides. The falſe Ribs from the fourth upward; in the ſame manner.

### 109. *Sterno-Coſtales.*

The Sternum; the Edge of the lower half of the inſide. The ſecond, third, fourth, fifth and ſixth true Ribs; the Cartilages near the bony Portions.

*Muſcles which move the Head on the Trunk.*

### 110. *Sterno-Maſtoidæus.*

The Sternum; the upper Edge, near the Clavicular Notch. The Clavicula; near the Sternal Extremity. The Maſtoide Apophyſis; the upper and back part.

### 111. *Splenius.*

The Os Occipitis; the lateral crooked Portion of the Tranſverſe Line. The Maſtoide Apophyſis; the upper part. The firſt three or four Vertebræ of the Neck; the Tranſverſe and Spinal Apophyſes. The firſt three or more Vertebræ of the Neck; the Spinal Apophyſes.

### 112. *Complexus Major.*

The firſt Vertebra of the Neck; backward near the Tranſverſe Apophyſis. The ſix following Vertebræ; the Tranſverſe Apophyſes. The Os Occipitis; the poſterior Portion of the ſuperior tranſverſe Line.

### 113. *Complexus Minor.*

The ſix lower Vertebræ of the Neck; the Tranſverſe Apophyſes. The Maſtoide Apophyſis; poſteriorly.

### 114. *Rectus Major.*

The ſecond Vertebra of the Neck; the Spinal Apophyſis. The Os Occipitis; the poſterior part of the inferior tranſverſe Line.

### 115. *Rectus Minor.*

The firſt Vertebra of the Neck; the poſterior Tubercle. The Os Occipitis; below the poſterior part of the lower tranſverſe Line, in a Foſſula near the Criſta.

### 116. *Obliquus Superior.*

The firſt Vertebra of the Neck; the Extremity of the Tranſverſe Apophyſis. The Os Occipitis; the middle Portion of the inferior Tranſverſe Line.

### 117. *Obliquus Inferior.*

The firſt Vertebra of the Neck; the Tranſverſe Apophyſis. The ſecond Vertebra; the Spinal Apophyſis.

### 118. *Rectus Anticus Longus.*

The third, fourth, fifth, and ſixth Vertebræ of the Neck; the forepart of the Tranſverſe Apophyſes. The Os Occipitis; the lower and anterior part of the Apophyſis Baſilaris.

### 119. *Rectus Anticus Brevis.*

The firſt Vertebra of the Neck; on one ſide of the anterior middle Eminence. The Os Occipitis; the Apophyſis Baſilaris, a little more forward than the Condyle.

### 120. *Tranſverſalis Anticus Primus.*

The firſt Vertebra of the Neck; the foreſide of the Tranſverſe Apophyſis. The Baſis of the Occipital Bone; below the Edge of the Jugular Foſſula.

### 121. *Tranſverſalis Anticus Secundus.*

The ſecond Vertebra of the Neck; the middle of the Tranſverſe Apophyſis, anteriourly. The firſt Vertebra; the Baſis of the Tranſverſe Apophyſis, anteriourly.

### 122. *Muſculi Acceſſorii.*

The Baſis of the Os Occipitis. The firſt two Vertebræ of the Neck.

*Vertebral Muſcles in general.*

The ſeveral Claſſes of the Vertebral Muſcles are theſe. (1.) Spinales Simplices. (2.) Spinales Compoſiti. (3.) Tranſverſales Simplices. (4.) Tranſverſales Compoſiti. (5.) Spino-Tranſverſales. (6.) Tranſverſo-Spinales. (7.) Obliqui which go from one Tranſverſe, to ſeveral Spinal Apophyſes. (8.) Obliqui which go from ſeveral Tranſverſe, to one Spinal Apophyſis.

*Vertebral Muſcles in particular.*

### 123. *Longus Colli.*

The firſt Vertebra of the Neck; the middle Tubercle. The three following Vertebræ; the Bodies anteriourly. The ſecond, third, fourth, fifth and ſixth Vertebræ of the Neck; the Bodies near the Tranſverſe Apophyſes, and theſe Apophyſes anteriourly. The laſt Vertebra of the Neck; the anterior lateral part of the Body. The firſt three, and ſometimes the fourth Vertebra of the Back, in the ſame manner.

### 124. *Tranſverſalis Colli Major.*

All the Vertebræ of the Neck; the Tranſverſe Apophyſes. The firſt four, five or ſix Vertebræ of the Back; in the ſame manner.

### 125. *Tranſverſalis Colli Minor.*

On one ſide of the Tranſverſalis Major.

### 126. *Semi-Spinalis.*

All the Vertebræ of the Neck, except the firſt. The ſix upper Vertebræ of the Back, or more.

### 127. *Spinales Colli Minores.*

All the Vertebræ of the Neck, except the firſt; the Spinal Apophyſes. The firſt Vertebra of the Back; in the ſame manner.

### 128. *Tranſverſales Colli Minores.*

The Vertebræ of the Neck; the Tranſverſe Apophyſes. The firſt Vertebra of the Back; the Spinal Apophyſis.

### 129. *Sacro-Lumbaris.*

The Vertebræ of the Neck; the Tranſverſe Apophyſes. The Ribs; the angular Marks. The Os Sacrum; the Superior Spines, and contiguous lateral Parts. The Os Ilium; the poſterior Portion of the Criſta and the Tuberoſity.

### 130. *Longiſſimus Dorſi.*

The laſt Vertebra of the Neck; the Tranſverſe Apophyſis. The firſt ſeven Vertebræ of the Back; the Tranſverſe Apophyſes. The laſt Vertebra of the Back; the Spinal Apophyſis. All the Vertebræ of the Loins; the Spinal Apophyſes. The Os Sacrum; the Superior Spines, and upper lateral part. All the true Ribs; the Tuberoſities. All the falſe Ribs; between the Tuberoſities and the angular Marks.

### 131. *Spinalis Dorſi Major.*

ALL the Vertebræ of the Back, except the firſt, and ſometimes the ſecond; the Spinal Apophyſes. The firſt and ſometimes the ſecond Vertebra of the Loins; the Spinal Apophyſes.

### 132. *Spinales Dorſi Minores.*

ALL the Vertebræ of the Back; the Spinal Apophyſes. The firſt Vertebra of the Loins; in the ſame manner.

### 133. *Tranſverſalis Dorſi Major.*

Vide Longiſſimus Dorſi.

### 134. *Tranſverſales Dorſi Minores.*

THE Vertebræ of the Back; the Tranſverſe Apophyſes.

### 135. *Semi-Spinalis Dorſi.*

THE Vertebræ of the Back; the twelve Spinal, and ten loweſt Tranſverſe Apophyſes. The firſt three Vertebræ of the Loins; the Tranſverſe Apophyſes.

### 136. *Semi-Spinalis Lumborum.*

THE three loweſt Vertebræ of the Loins; the Tranſverſe and Articular Apophyſes. The Os Sacrum; the ſuperior lateral Parts. The Os Ilium; the ſuperior poſterior Spine.

### 137. *Quadratus Lumborum.*

THE laſt falſe Rib. The Vertebræ of the Loins; the Tranſverſe Apophyſes. The Os Sacrum; the upper lateral Part. The Os Ilium; almoſt the poſterior half of the Criſta.

### 138. *Spinales & Tranſverſales Lumborum.*

THE Os Sacrum; the Superior Spines. The Vertebræ of the Loins; the Spinal and Tranſverſe Apophyſes.

### 139. *Coccygæus Anterior.*

The Os Ilium; the inſide. The Os Iſchium; the inſide of the Body of the Bone, behind the Foramen Ovale. The Os Coccygis; the lateral and lower part of the Inſide.

### 140. *Coccygæus Poſterior.*

The Os Sacrum; the foreſide of the firſt two Vertebræ. The Os Iſchium; the inſide of the Spine. The Os Coccygis; the lateral middle part of the Inſide.

### 141. *Pſoas Parvus.*

The laſt Vertebra of the Back, or firſt of the Loins, or both; the Tranſverſe Apophyſes. The Os Pubis; the Criſta.

*Muſcles which move the Lower Jaw.*

### 142. *Maſſeter.*

The Os Temporum; the Zygomatic Apophyſis. The Os Maxillare; near the Os Malæ. The Os Malæ; the lower Edge; the Lower Jaw; at the Angle, above the Angle, and at the Root of the Coronoide Apophyſis; all on the outſide.

### 143. *Temporalis.*

The Os Frontis; the outſide, behind the angular Apophyſis. The Os Parietale; the outſide, between the Semi-Circular Impreſſion, and the Squammous Slope. The Os Temporum; the outſide of the Squammous Portion. The Os Sphenoidale; the outſide of the great Temporal Ala. The Os Malæ; the Zygomatic Foſſa. The Maxilla Inferior; the Coronoide Apophyſis.

### 144. *Pterygoidæus Internus.*

The Os Sphenoides; the Pterygoide Apophyſis, at the inſide of the external Ala. The Maxilla Inferior; the inſide near the Angle.

### 145. *Pterygoidæus Externus.*

The Os Sphenoidale; the Apophyſis Pterygoides, at the outſide of the external Ala. The Maxilla Inferior; the Foſſula of the Condyloide Apophyſis.

146. *Di-*

### 146. *Digaſtricus.*

The Os Temporum; the Maſtoide Sulcus. The Lower Jaw, the inner Labium of the Baſis of the Chin. The Os Hyoides; the lateral Part.

### 147. *Mylo-Hyoidæus.*

*Muſcles which move the Os Hyoides.*

The Maxilla Inferior; the inſide, above the oblique prominent Line. The Os Hyoides; the Baſis, anteriourly.

### 148. *Genio-Hyoidæus.*

The Maxilla Inferior; the inſide of the Chin, at the inferior rough Impreſſion, near the Symphyſis. The Os Hyoides; the upper part of the Baſis anteriourly, and the Root of the Cornu.

### 149. *Stylo-Hyoidæus.*

The Os Temporum; the Baſis of the Apophyſis Styloides. The Os Hyoides; the lateral part of the Baſis, and the Symphyſis of the Cornu.

### 150. *Omo-Hyoidæus.*

The Scapula; the Superior Coſta, and ſometimes the Coracoide Apophyſis. The Os Hyoides; the lateral inferior part of the Baſis, near the Cornu.

### 151. *Sterno-Hyoidæus.*

The Sternum; the upper part toward the inſide, near the Notch. The Clavicula ſometimes; the Sternal Extremity. The Os Hyoides; the lower Edge of the Baſis.

## ART. XX.

## *An Enumeration of the Bones mentioned in the Deſcription of the Muſcles; and of the Muſcles inſerted in each Bone.*

### 1. *Os Frontis.*

Temporalis.

### 2. *Os Parietale.*

Temporalis.

### 3. *Os Temporum.*

Temporalis. Maſſeter. Digaſtricus. Stylo-Hyoidæus. Sterno-Maſtoidæus. Splenius. Complexus Minor.

### 4. *Os Sphenoidale.*

Temporalis. Pterygoidæus Externus. Pterygoidæus Internus.

### 5. *Os Occipitis.*

Splenius. Complexus Major. Complexus Minor. Rectus Major Poſticus. Rectus Minor Poſticus. Obliquus Minor. Sterno-Maſtoidæus. Rectus Anticus Longus. Rectus Anticus Brevis. Tranſverſalis Anticus Primus. Trapezius Scapulæ.

### 6. *Os Malæ.*

Temporalis. Maſſeter.

### 7. *Maxilla Inferior.*

Maſſeter. Temporalis. Pterygoidæus Internus. Pterygoidæus Externus. Digaſtricus. Genio-Hyoidæus. Mylo-Hyoidæus.

### 8. *Os Hyoides.*

Stylo-Hyoidæus. Genio-Hyoidæus. Mylo-Hyoidæus. Omo-Hyoidæus. Sterno-Hyoidæus.

### 9. *Vertebræ Colli.*

Splenius. Complexus Major. Complexus Minor. Rectus Major Poſticus. Rectus Minor Poſticus. Obliquus Superior. Obliquus Inferior. Rectus Anticus Longus. Rectus Anticus Brevis. Tranſverſalis Anticus Primus. Tranſverſalis Anticus Secundus. Longus Colli. Tranſverſalis Major Colli. Tranſverſalis Gracilis Colli. Semi-Spinalis Colli. Spinales Colli Minores. Tranſverſales Colli Minores. Scaleni. Trapezius Scapulæ. Rhomboides. Angularis. Longiſſimus Dorſi. Serratus Superior Poſticus. Sacro-Lumbaris. Supra-Coſtales.

### 10. *Vertebræ Dorſi.*

Trapezius. Latiſſimus Dorſi. Rhomboïdes. Serratus Superior Poſticus. Splenius. Complexus Major. Complexus Minor. Longus Colli. Tranſverſalis Colli Major. Tranſverſalis Colli Gracilis. Semi-Spinalis Colli. Tranſverſalium Colli Minorum unus. Sacro-Lumbaris. Longiſſimus Dorſi. Longiſſimus Dorſi Acceſſorius. Spinalis Dorſi Major. Tranſverſalis Dorſi Major. Tranſverſales Dorſi Minores. Supra-Coſtales. Semi-Spinalis Dorſi. Diaphragma. Serratus Poſticus Inferior. Pſoas Major. Pſoas Parvus. Pſoas Parvus Acceſſorius.

### 11. *Vertebræ Lumborum.*

Tranſverſalis Abdominis. Latiſſimus Dorſi. Quadratus Lumborum. Lumbaris Externus Minor. Diaphragma. Semi-Spinalis Lumborum. Spinales Lumborum. Pſoas Parvus. Serratus Inferior Poſticus.

### 12. *Os Sacrum.*

Latiſſimus Dorſi. Sacro-Lumbaris. Longiſſimus Dorſi. Semi-Spinalis Lumborum. Spinalium & Tranſverſalium Lumborum unus. Sacro-Coccygæus. Glutæus Maximus.

### 13. *Os Coccygis.*

Sacro-Coccygæus. Iſchio-Coccygæus. Glutæus Maximus.

### 14. *Sternum.*

Sterno-Maſtoidæus. Sterno-Hyoidæus. Subclavius. Pectoralis Major. Sterno-Coſtales. Diaphragma. Tranſverſalis Abdominis. Rectus Abdominis.

### 15. *Coſtæ.*

Supra-Coſtales. Inter-Coſtales. Sub-Coſtales. Sterno-Coſtales. Scaleni. Serratus Poſticus Superior. Serratus Poſticus Inferior. Sacro-Lumbaris. Longiſſimus Dorſi. Diaphragma. Quadratus Lumborum. Subclavius. Pectoralis Minor. Pectoralis Major. Serratus Major. Latiſſimus Dorſi. Obliquus Externus Abdominis. Obliquus Internus Abdominis. Tranſverſalis Abdominis. Rectus Abdominis.

### 16. *Os Ilium.*

Obliquus Externus Abdominis. Obliquus Internus Abdominis. Tranſverſalis Abdominis. Latiſſimus Dorſi. Sacro-Lumbaris. Longiſſimus Dorſi. Quadratus Lumborum. Iliacus. Glutæus Maximus. Glutæus Medius. Glutæus Minimus. Pyriformis. Obturator Internus. Muſculus Faſciæ Latæ. Sartorius. Rectus Gracilis.

### 17. *Os Pubis.*

Obliquus Abdominis Externus. Obliquus Internus Abdominis. Tranſverſalis Abdominis (*ſometimes*). Rectus Abdominis. Pyramidalis Abdominis. Pſoas Parvus. Pectineus. Obturator Externus. Obturator Internus. Rectus ſive Gracilis Internus. Triceps Primus. Triceps Secundus.

### 18. *Os Iſchium.*

Coccygæus Anterior. Obturator Internus. Gemelli. Obturator Externus. Quadratus Femoris. Triceps Secundus (*ſometimes*). Triceps Tertius. Biceps Tibiæ. Semi-Nervoſus. Semi-Membranoſus.

### 19. *Scapula.*

Omo-Hyoidæus. Trapezius. Rhomboides. Angularis. Pectoralis Minor. Serratus Major. Supra-Spinatus. Infra-Spinatus. Teres Major. Teres Minor. Sub-Scapularis. Latiſſimus Dorſi. Biceps. Anconæus Maximus. Deltoides.

### 20. *Clavicula.*

Sterno-Maſtoidæus. Sterno-Hyoidæus. Trapezius. Subclavius. Deltoides. Pectoralis Major.

### 21. *Os Humeri.*

Deltoides. Pectoralis Major. Latiſſimus Dorſi. Teres Major. Supra-Spinatus. Infra-Spinatus. Biceps. Brachialis. Anconæus Externus. Anconæus Internus. Anconæus Minimus. Ulnaris Internus. Radialis Internus. Ulnaris Gracilis. Ulnaris Externus. Radialis Externus. Supinator Longus. Supinator Brevis. Pronator Teres. Extenſor Digitorum Communis.

### 22. *Ulna.*

Brachialis. Anconæus Major. Anconæus Externus. Anconæus Internus. Anconæus Minor. Pronator Quadratus. Ulnaris Internus. Ulnaris Externus. Extenſores Pollicis. Perforatus. Perforans. Extenſor Indicis Proprius. Extenſor Minimi Digiti Proprius.

### 23. *Radius.*

Biceps. Supinator Longus. Supinator Brevis. Pronator Teres. Pronator Quadratus. Ulnaris Externus *(in the annular Ligament at the Head of the Radius).* Flexor Pollicis Longus. Perforatus. Extenſor Digitorum Communis.

### 24. *Os Piſiforme & Unciforme.*

Ulnaris Internus.

### 25. *Os Schaphoides.*

Ulnaris Gracilis ſive Palmaris Longus.

### 26. *Os Naviculare, Magnum & Trapezoides.*

Interoſſei.

### 27. *Bones of the Metacarpus.*

Interoſſei. Radiales Externi. Meſothenar. Metacarpius. Hypothenar Minor.

### 28. *Firſt Phalanx of the Thumb.*

Extenſor Pollicis Primus. Thenar. Meſothenar, Antithenar.

29. *Second*

### 29. *Second Phalanx of the Thumb.*

Extenſor Pollicis Primus & Secundus. Thenar. Meſothenar.

### 30. *Third Phalanx of the Thumb.*

Flexor Pollicis Longus.

### 31. *Firſt Phalanges of the Fingers.*

Extenſor Digitorum Communis. Interoſſei.

### 32. *Second Phalanges of the Fingers.*

Perforatus.

### 33. *Third Phalanges of the Fingers.*

Extenſor Digitorum Communis. Perforans.

### 34. *Index.*

Extenſor Indicis proprius.

### 35. *Little Finger.*

Extenſor Minimi Digiti Proprius.

### 36. *Os Femoris.*

Pſoas. Iliacus. Pectineus. Glutæus Maximus, Medius, & Minimus. Muſculus Faſciæ Latæ. Triceps Primus, Secundus, & Tertius. Vaſtus Externus. Vaſtus Internus. Crureus. Biceps. Popliteus. Gaſtrocnemii. Tibialis Gracilis.

### 37. *Patella.*

Vaſtus Externus. Vaſtus Internus. Crureus. Rectus Anterior.

### 38. *Tibia.*

Vaſtus Externus. Vaſtus Internus. Rectus Anterior. Semi-Membranoſus. Semi-Nervoſus. Gracilis Internus. Sartorius. Popliteus. Tibialis Anticus. Extenſor Pollicis Longus. Extenſor Digitorum Longus. Soleus. Tibialis Poſticus. Peronæus Longus. Flexor Digitorum Longus.

39. *Fibula*

### 39. *Fibula.*

Biceps. Peronæus Medius. Peronæus Minimus. Soleus. Peronæus Longus. Extenſor Pollicis Longus. Flexor Pollicis Longus. Extenſor Digitorum Longus.

### 40. *Aſtragalus.*

Extenſor Digitorum Brevis.

### 41. *Os Calcis.*

Gaſtrocnemii. Soleus. Tibialis Gracilis. Tibialis Poſticus. Thenar. Perforatus ſive Flexor Digitorum Brevis. Flexor Digitorum Acceſſorius. Metatarſius. Parathenar Major.

### 42. *Os Scaphoides.*

Tibialis Poſticus. Thenar.

### 43. *Os Cuneiforme Majus.*

Tibialis Anticus. Peronæus Maximus. Thenar.

### 44. *Bones of the Metatarſus.*

Tibialis Anticus. Peronæus Maximus. Antithenar. Tranſverſalis Pedis. Interoſſei. Peronæus Medius. Peronæus Minimus. Metatarſius. Parathenar Minor.

### 45. *Bones of the Great Toe.*

Extenſor Pollicis Longus. Extenſor Pollicis Brevis. Tranſverſalis Pedis. Thenar. Antithenar. Flexor Pollicis Longus.

### 46. *Bones of the Small Toes.*

Flexor Digitorum Longus. Interoſſei. Flexor Digitorum Brevis. Parathenar Major. Extenſor Digitorum Longus, Extenſor Digitorum Brevis.

## ART. XXI.

### *The particular Uſes of the Muſcles, which are wholly inſerted in Bones.*

777. I Observed in the beginning of this Section N° 34. that the Uſe of each Muſcle in particular, is confined to the Motion of one or more moveable Parts; and that ſome Parts require a certain number of Muſcles to move them, whereof ſome act one way and ſome another. Several Muſcles, for Inſtance, move the Os Humeri upon the Scapula, and of theſe, ſome raiſe, others depreſs it; ſome turn it forward, ſome backward, and others round its Axis, &c.

778. I took notice N° 37. of the Inconveniencies of the common Language of Anatomiſts, with reſpect to the names of many Muſcles; with reſpect to the Uſes attributed to them, they being limited to theſe, as if they could not have any other; and with reſpect to the Bones, the changes of Situation of which, are confined to the Action of a certain number of Muſcles, as if no other Muſcles were capable of producing them.

779. I remarked N° 38. 39. that in order to ſhun theſe inconveniencies, it would be proper to diſtribute and enumerate the Muſcles in another manner than is commonly done. Thus, for inſtance, inſtead of this Title: The Muſcles of the Arm, I would put the following: The Muſcles which move the Os Humeri on the Scapula, and the Scapula on the Os Humeri. But leſt ſuch Titles might be reckoned too long, I have omitted the reciprocal Motions, mentioning them only in the Deſcription of each Muſcle; and there I have likewiſe pointed out the other Muſcles which may have the ſame uſes with thoſe I treat of; and alſo the other uſes which theſe Muſcles may have. The Muſcles which may move certain Bones without being inſerted in them, I term Aſſiſtant or Auxiliary Muſcles.

780. Before we enter upon the detail of theſe particular uſes, it is likewiſe proper to call to mind what I ſaid N° 41. 42. 43. concerning the Congeneres and Antagoniſt Muſcles; concerning ſimple and direct Motions, and thoſe that are combined or compounded; concerning Tonic Motions; concerning the Co-operation of Muſcles, and concerning the diſtinction of principal Movers, Moderators and Directors.

781. It will not be amiſs to repeat here what I ſaid N° 56. and 58. that in order to comprehend all the uſes and contrivances of each Muſcle in particular, we ought to examine its Place or Situation in general, its external Conformation, Structure or Compoſition, particular Situation, Direction, lateral Connexions; how it is diſpoſed with reſpect to the neighbouring Muſcles, for the production of ſimple Motions; and with reſpect to the Muſcles at a greater diſtance, for the production of compound Motions; and laſtly, with reſpect to the Bones, as a moving Power, applied to the different kinds of Levers.

782. These Inquiries very neceſſary for Philoſophical Reaſonings, Phyſical Preſcriptions and Surgical Operations, will be very much facilitated by the help of the two foregoing Tables; in the firſt of which we ſee at one view, in what Bones, in how many Bones, and in what parts of Bones, each Muſcle is inſerted; and in the ſecond, to what Muſcles, and to what Number of Muſcles, each Bone gives Inſertions.

783. But to make a due uſe of theſe two Tables, we ought to be previouſly acquainted with the Articulations of Bones, eſpecially thoſe of freſh Subjects, and from thence be able exactly to determine in how many different Directions each Bone is capable of being moved. We ought likewiſe to know not only the general Direction of each Muſcle, but alſo all the poſſible Situations or different Attitudes of the Bones in which each Muſcle is inſerted.

784. The Experiments made on dead Bodies, by pulling the Muſcles after they have been raiſed, are very fallacious; eſpecially in the long Muſcles parted from all their lateral Connexions; and ſtill more when the natural Direction of theſe Muſcles is oblique, or when they are naturally deſigned for oblique Motions; not to mention how much by this way of management, a diſſected Muſcle may be increaſed in length. We have inſtances of ſuch miſtakes in the Sterno-Maſtoidæus, Supinator Longus, Sartorius, Peronæus Longus, &c. as we ſhall ſee hereafter.

785. The terms of raiſing, depreſſing, bringing forward, backward, &c. uſed here, are to be conſidered as applied to the Subject in an erect Poſture; and I underſtand by them not only the effects of a real Motion, or a real change of Situation; but alſo the Force employed to keep any part in the ſame Situation againſt a Reſiſtance or contrary Force.

786. Thus when I ſay that the Biceps bends the Fore-Arm, I mean likewiſe that its Action tends to preſerve that part in any given Situation againſt a contrary Force applied to extend it; and we ſee from experience, that in theſe kinds of Efforts, without any real Motion, in proportion as the Reſiſtance increaſes, the Muſcle grows ſtiffer or harder, without producing any change of Place.

### § 1. *Uſes of the Muſcles which move the Bones of the Shoulder on the Trunk.*

787. The Mechaniſm of the Scapula in relation to its Motions and Changes of Situation, is very different from that of all the other Bones of the Body, except the Os Hyoides, of which I ſhall ſpeak hereafter. All the other Bones have ſolid Fulcra or fixed Points, on which they are either moved or fixed by the Muſcles; but the motions of the Scapula, its changes of Situation, and its continuance in any one given Attitude, are brought about without the help of any ſolid Fulcrum. The Muſcles alone ſuſtain it and brace it down, in all its different Motions and Situations.

788. The Scapula has this peculiarity likewiſe belonging to it, that it is the Fulcrum and Baſis of all the Motions of the Os Humeri, of ſome Motions of the Fore-Arm; and even of all the moſt violent Efforts made

with theſe Bones; without being itſelf either moved or fixed on any ſolid Baſis.

789. We ought not here to have any regard to the Clavicula, which ſeems to be only a kind of Os Acceſſorium in Men, and ſuch other Animals as can turn their Fore-Feet forward, to lay hold of any thing, almoſt in the ſame manner as we turn the Hand in Supination and Pronation. In all other Animals, no Claviculæ are to be found; and therefore the Scapula is the principal, or rather the only Piece of which the Shoulder is formed.

790. The Motions and different Situations of the Shoulder in Men, depend chiefly on the Scapula. The Clavicle is puſhed or pulled in different Directions by the other Bone, and entirely follows its Motions, ſerving in ſome circumſtances to regulate or limit them.

791. It is neceſſary to examine with attention all the Motions of which the Scapula can be capable. It is not enough to ſay that it may be raiſed, brought down, forward, backward, &c. which Language, as commonly underſtood, has given riſe to ſeveral falſe Ideas concerning the Action of the Muſcles to which the Motions of this Bone are attributed.

792. When we raiſe the Shoulder, this Motion is not ordinarily made by an uniform Elevation of the Scapula, or as it were, in a direction parallel to itſelf. It is the Acromium which riſes, and while the ſuperior Angle deſcends, the inferior Angle is removed to a greater diſtance from the Spina Dorſi. When the Shoulder is depreſſed, the Acromium falls down more or leſs, the ſuperior Angle riſes in proportion, and the inferior Angle is brought nearer the Vertebræ.

793. The Shoulder can ſcarcely be brought forward or toward the foreſide of the Thorax, without being proportionably raiſed; and there is the ſame difficulty in drawing it back without depreſſing it more or leſs. Every one may ſoon ſatisfy himſelf as to the truth of theſe facts. All theſe different Attitudes are regulated by the Clavicula, the Angle which it naturally makes with the Scapula, being leſſened or made more acute in raiſing the Shoulder, or in bringing it forward; and increaſed or made more obtuſe when the Shoulder is depreſſed or drawn backward.

794. Therefore in moſt of the Motions or Changes of Situation performed by the Scapula, this Bone turns more or leſs upon its own Plane, and that in two contrary Directions. It cannot indeed be abſolutely denied but that the Scapula may be brought directly forward or backward, without being raiſed or depreſſed; but theſe are very conſtrained and very inconſiderable Motions. In the firſt caſe, the Acromium together with the Humeral Extremity of the Clavicula, is removed to a greater diſtance from the Ribs, and in the ſecond, it is brought nearer the Ribs.

795. We ought to conſider with particular attention, the Situation and Motion of the Shoulder when we raiſe it to ſupport a Burden, or apply it to any other Reſiſtance. It is the Acromium alone which is expoſed, and loaded, and with which we endeavour to overcome the Reſiſtance or ſupport the Burden without ſinking under it. There muſt be Muſcles proper

for making all theſe Efforts, and capable of producing all the different Motions.

796. The three different Portions of the Trapezius, may all have the ſame uſe, according to what I have obſerved concerning the different turns of the Scapula in its Motions. This uſe is to raiſe the Shoulder and to keep it from ſinking. The upper Portion draws the Acromium and Extremity of the Clavicula upward. The inferior Portion draws downward the ſmall Extremity of the Spine of the Scapula. By theſe two contrary Motions, the Situation of the Spine is changed; and as the Acromium by reaſon of its Articulation with the Clavicle, cannot move backward while it riſes, the ſmall Extremity of the Spine muſt be removed to a greater diſtance from the Vertebræ while it deſcends. *Trapezius.*

797. The middle Portion, by its ſuperior and longeſt Fibres, concurs with the Action of the upper Portion, more or leſs, according to the Extent and direction of theſe Fibres. The other Fibres which become gradually ſhorter and more tranſverſe, partly join in the ſame Action by reaſon of the Obliquity of the Spine in which they are inſerted, and partly ſerve to regulate and limit the removal of the Spine from the Vertebræ already mentioned.

798. The upper Fibres of this middle Portion may likewiſe in ſome circumſtances ſupply the place of the ſuperior Portion; as when we would raiſe the Shoulder, the Head being inclined to the ſame ſide; for then, the Fibres of the ſuperior Portion which are inſerted in the Os Occipitis, have not room enough to contract. The Obliquity of the upper Fibres of the middle Portion, and of the Spine of the Scapula in which they are inſerted, facilitates their Action in this Caſe.

799. The uſe of the Trapezius therefore, regard being had to the Direction and Inſertion of its Fibres, is to raiſe the Shoulder, or rather to turn the top of the Scapula upward, and to hinder it from ſinking. But it is too thin and conſiſts of too few Fibres, to be able to overcome or bear up againſt ſome Reſiſtances, without the Co-operation of the Serratus Major, as we ſhall ſee preſently.

800. From this account of the uſe of the Trapezius, we ſee how improper it is to ſay with the generality of Anatomiſts, that the ſuperior Portion of this Muſcle draws the Scapula obliquely upward; the inferior Portion obliquely downward; and all the three Portions, directly backward. This way of ſpeaking is not only improper, but likewiſe leads us to imagine that by the Action of the Trapezius all the parts of the Scapula are raiſed, depreſſed or carried backward.

801. The Serratus Major raiſes the Shoulder or Top of the Scapula, brings it forward and hinders it from ſinking. In all theſe, it is the principal Actor; and it is impoſſible to conceive how Labourers raiſe and ſupport by the Shoulder alone, the heavy Burdens with which they are loaded, without the Aſſiſtance of this Muſcle. *Serratus Major.*

802. The thickneſs, length and particular Diſpoſition of its Fibres, but above all, the Inſertion of the greateſt Portion of them, near the Angle

of the Baſis Scapulæ, prove ſufficiently what I advance; and the general Action of the radiated Portions is to draw the inferior Angle from the Spina Dorſi, toward the lateral parts of the Thorax.

803. The uppermoſt and ſtrongeſt Portions pull this Angle upwards at the ſame time, and conſequently raiſe the Acromium, which cannot be puſhed forward, by Reaſon of its Connexion with the Clavicula.

804. These ſuperior Portions croſs over the greateſt part of the true Ribs; and accordingly in raiſing great Burdens, we find our ſelves obliged to hold in our Breath, that is to leſſen Expiration as much as we can, in order to fix the Ribs, and to hinder them from ſinking, that they may ſerve for a ſolid Fulcrum to this Muſcle in proportion to the force with which it acts.

805. The next Portions run according to the length of the Ribs, and conſequently do not much conſtrain them in their reciprocal Motions, not being in a condition either to raiſe or depreſs them; and the moſt inferior and weakeſt Portions are only Aſſiſtants to the reſt in bringing the lower Angle of the Scapula forward, toward the lateral part of the Thorax.

806. The ſmall diſtinct Plane deſcribed Nº 164 is not an aſſiſtant to the radiated Portions or inferior part of the great Plane. It ſeems deſigned to regulate the Motion of the ſuperior Angle backward and downward, while the inferior is carried forward and upward by the radiated Portions; and when their Action ceaſes, to bring the Scapula back to its natural Place.

807. The ſuperior Portion of the great Plane is an Aſſiſtant partly to the radiated Portion, and partly to the ſmall Plane, according to the different Places of its Inſertions in the Baſis of the Scapula.

808. From all this we ſee that the principal uſe of the Serratus Major is to raiſe the Shoulder, and not for Reſpiration. When both Planes act together, this Muſcle may in ſome Caſes bring the Shoulder directly forward, or rather hinder it from going back; as when we puſh any thing with great force directly forward, with the Hand, eſpecially when the Arm is extended.

809. A whole Treatiſe might be written on the numerous Phænomena obſervable in the Motion of the Shoulder by the Action of this Muſcle; as I have ſhewn in the Memoirs of the Royal Academy of Sciences. Some of theſe ſhall be mentioned in deſcribing the uſes of the other Muſcles that move the Shoulder; and when I come to thoſe which are imployed in Reſpiration, I ſhall explain more at length, why this Muſcle can have no part therein.

*Rhomboides.* 810. According to the Inſertions and Direction of the Rhomboides, its general uſe muſt be to draw backward and upward the Sub-Spinal Portion of the Baſis Scapulæ.

811. It is likewiſe a Moderator to the Trapezius and Serratus Major, when they raiſe the Shoulder or carry the Acromium upward; and it brings the Scapula back to its natural Situation, when the Action of theſe Muſcles ceaſes.

812. It may draw the Scapula directly backward, if the inferior Portion of the Trapezius acts at the ſame time. For as this Portion draws obliquely downward and toward the Spina Dorſi, and the Rhomboides, obliquely upward and toward the ſame Spine; the joint Action of both muſt produce a Motion directly backward, as it happens when we pull back both Shoulders equally in order to diſengage them.

813. It may likewiſe together with the radiated Portion of the Serratus Major, draw the Baſis of the Scapula directly backward. This however is but an inconſiderable Motion, and not ſo eaſy as the reſt, for the Serratus Major contributes to it only in proportion to the Action of the Rhomboides, which is but very ſmall; and in this caſe the Acromium can riſe but a very little way.

*Angularis.*

814. The Angularis by its Inſertion in the ſuperior Angle of the Scapula, moderates the deſcent of that Angle, while the Trapezius, and Serratus Major raiſe the Acromium. Afterwards when theſe two Muſcles ceaſe to act, the Angularis raiſes the ſuperior Angle, and by that means depreſſes the Acromium, much in the ſame manner as was obſerved of the Rhomboides.

815. From hence we ſee that this Muſcle is very improperly call'd Levator Scapulæ Proprius, ſince it does not raiſe but depreſſes the Scapula. That name would agree better to the Serratus Major. Whether this Muſcle can have any ſhare in moving the Neck, the Scapula in which it is inſerted being kept immoveable by other Muſcles, I cannot at preſent determine.

*Pectoralis Minor.*

816. The Pectoralis Minor aſſiſts the Rhomboides and Angularis as Moderators of the Action of the Trapezius and Serratus Major, in turning the Point of the Acromium upward, the ſuperior Angle downward, and the inferior Angle forward.

817. It is likewiſe an Aſſiſtant to the Rhomboides and Angularis, in reſtoring the Scapula to its natural Situation, when the Trapezius and Serratus Major ceaſe to act; by drawing downward the Apophyſis Coracoides in which it is inſerted.

818. It has been reckoned among the Muſcles imployed in Reſpiration, by ſome who imagine that in ſome caſes the Shoulder may be kept ſo ſteady, as that this Muſcle may be able to raiſe the Ribs in which it is fixed. But as the Serratus Major which muſt principally be imployed in keeping the Shoulder in a fixed Poſition, is partly inſerted in the ſame Ribs, and in this Action, muſt keep them depreſſed, it will be impoſſible for the Pectoralis Minor to raiſe them.

*Subclavius.*

819. The Subclavius can have no other ordinary uſe, but to bring down the Clavicula, after it has been raiſed together with the Acromium by the Action of the Trapezius and Serratus Major. It may likewiſe hinder not only the Clavicula in which it is inſerted, but likewiſe the Acromium from riſing, eſpecially when aſſiſted by the Pectoralis Minor, Rhomboides and Angularis.

820. When we ſtand or ſit, the weight of the Arm alone ſeems to be ſufficient to bring down the Clavicula when raiſed; and therefore in this

caſe there would be no occaſion for the Subclavius to act upon the Clavicle, nor for the Pectoralis Minor, Rhomboides and Angularis to act upon the Acromium. But when we lie or are ſituated in any other manner, the Weight of the Arm has no ſuch effect; and in theſe caſes theſe four Muſcles become more or leſs neceſſary.

821. The Subclavius therefore is a proper Depreſſor of the Clavicula; and an aſſiſtant Depreſſor of the Acromium, or of the Shoulder in general, together with the Pectoralis Minor, Rhomboides and Angularis, all which in their turns, aſſiſt the Subclavius in its Action on the Clavicula.

822. I cannot conceive what has led ſeveral great Anatomiſts to rank this among the Muſcles of Reſpiration; ſince it is inſerted not only in the Bone but in the Cartilage of the firſt Rib; ſince this Cartilage is not articulated with the Sternum, but joined to it as immoveably as to the Bone of the Rib by its other Extremity; and laſtly, ſince this Cartilage is much ſhorter, much broader, and much leſs pliable than the Cartilages of all the other Ribs, of equal thickneſs.

### § 2. *Uſes of the Muſcles which move the Os Humeri on the Scapula.*

*Deltoides.*

823. This Muſcle, from the diſpoſition of its inſertions in the Scapula and Clavicle, may raiſe the Arm or ſeparate it from the Ribs not only directly, but likewiſe obliquely in many different ways. The Arm being lifted directly upward, the lateral, anterior and poſterior Portions of this Muſcle, may bring the Arm ſo raiſed, forward and backward. In that caſe the middle Portion of the Muſcle is the principal Mover, and the lateral Portions are the Directors or Collateral Muſcles.

824. When we ſtand or ſit, this Muſcle alone, without the Help of any other, regulates the Depreſſion of the Arm, by means only of the Weight of the Part. This Depreſſion is brought about merely by the Relaxation of this Muſcle, proportionable to the degree of Velocity it has acquired, according as the will directs.

825. But when we lie, other Muſcles are neceſſary to bring the Arm near the Ribs, when the Deltoides has carried it to any diſtance from them. Yet even in this Caſe, when the Arm is laid cloſe to the Ribs, the lateral Portions of the Deltoides may preſs it harder againſt them, by reaſon of the change of Direction of the Fibres in this Situation.

826. By reaſon of the multiplicity of fleſhy Fibres, this Muſcle muſt act with a very conſiderable force.

*Latiſſimus Dorſi.*

827. The Latiſſimus Dorſi ſerves in general to bring down the Arm when raiſed; and this it does chiefly by its inferior Portion. By the ſame Portion and by the Connexion of the Scapula with the Os Humeri, it ſerves to depreſs the Shoulder, or to maintain it in that Situation againſt any Force that endeavours to raiſe it; as when we lean upon the Elbow in ſitting, or walk upon Crutches.

828. By its Dorſal Inſertion by the Paſſage of its Tendon on the inſide of the Os Humeri, and by its Inſertion in the foreſide of that Bone, it may turn

the Arm round its Axis, called Rotation by Anatomiſts; as it happens when having bent the Fore-Arm, we turn it behind our Back.

829. By its Inſertion in the Criſta of the Os Ilium, and in the falſe Ribs, it becomes neceſſary to raiſe the Head laterally to one ſide, when we lie on the other. For the Shoulder being then depreſſed and brought near the Thorax, the Clavicle becomes the fixed Point of one or two of the Muſcles which raiſe the Head in this Situation, as ſhall be ſhewn more at length in ſpeaking of the uſes of theſe Muſcles. Any Perſon may make the Experiment in Bed, by lying at full length on his ſide; for if while he raiſes his Head in this poſture, he lay his Hand on the anterior Edge of this Muſcle, he will find it conſiderably ſtretched, and alſo that this Tenſion ceaſes whenever he ceaſes to lift his Head.

830. The Connexion of this Muſcle with the falſe Ribs is the cauſe of that uneaſineſs which we find in breathing, when the Arm is pulled ſtrongly downward to preſs upon any thing, as when we ſeal a Letter, or lean upon a ſhort Cane, the Fore-Arm being extended.

831. The ſmall Portion inſerted in the inferior Angle of the Scapula, may be an Aſſiſtant to the Teres Major, as ſhall be ſhewn hereafter.

832. This Muſcle ſuſtains the Weight of the whole Body, when with the Arms raiſed, we hang by the Hands, as when we graſp the Branch of a Tree in climbing.

833. It performs the ſame Office, when we either ſit or ſtand with the whole Arm more or leſs extended horizontally, and preſs the Hand from above downward againſt any Reſiſtance; as when we ſupport ourſelves in this Situation, by a very long Cane graſped by the Hand; or lay hold of the upper part of an Halbard, and preſs the lower end ſtrongly againſt the Ground.

834. These laſt three Uſes cannot however be well executed by this Muſcle alone, without the aſſiſtance of the Pectoralis Major.

*Pectoralis Major.*

835. The Pectoralis Major ſerves in general to bring the Arm near the Ribs, to preſs it ſtrongly againſt them, and to carry it towards the forepart of the Thorax. This laſt Motion may be performed without ſeparating the Arm from the Ribs, as when one Arm is croſſed over the other; and it may likewiſe be done with the Arm raiſed, as when the Hand of one ſide is laid over the Shoulder of the other ſide; and in that caſe the anterior Portion of the Deltoides may aſſiſt this Muſcle in great Efforts.

836. By means of the Fold in its Tendon, the ſuperior and inferior Portions may act as two diſtinct Muſcles, that is, one may act without the other. The ſuperior fleſhy Portion which anſwers to the lower Portion of the Tendon, ſerves chiefly to raiſe the Arm forward.

837. The inferior fleſhy Portion which is joined to the upper Portion of the Tendon, by its Inſertion in the Os Humeri, and by the Connexion of that Bone with the Scapula, may depreſs the Shoulder or keep it from riſing, with more or leſs force, much after the ſame manner as the inferior Portion of the Latiſſimus Dorſi; the inferior Portions of theſe two Muſ-

cles concurring in the ſame uſe; as when we ſupport ourſelves upon our Hands, or walk with Crutches, as has been already ſaid.

838. It is likewiſe by means of the lower Portion of this Muſcle, that we can ſuſpend the whole Body by the Hands graſping the Branch of a Tree in climbing, &c. In this caſe alſo the Latiſſimus Dorſi acts in concert with the Pectoralis; and this Co-operation, the Painters and Carvers have taken care to expreſs in Crucifixes.

839. The inferior Portion of this Muſcle cannot perform theſe two uſes without the aſſiſtance of the Muſcles of the Abdomen, which, by pulling the Ribs downward, become in a manner a continuation of the Inſertion of this Portion. The ſame thing may be obſerved concerning that of the inferior Portion of the Latiſſimus Dorſi, which is inſerted in the falſe Ribs.

840. The Uſes of the ſuperior Portion and of all the Body of the Pectoralis, cannot take place without the Co-operation of the Muſcles which move the Scapula on the Trunk, eſpecially the Serratus Major; becauſe the Scapula muſt be ſecurely fixed, before it can be a Fulcrum for the Os Humeri to move upon. The ſame thing is to be obſerved concerning the Deltoides, and all the other Muſcles which move the Os Humeri on the Scapula.

*Teres Major.* 841. The Teres Major, by being inſerted in the Os Humeri in a Direction parallel to the Latiſſimus Dorſi, becomes a Congener to the ſuperior and poſterior Portion of that Muſcle; and accordingly moves the Os Humeri in the ſame manner with it. It turns the Bone round its Axis, when the Fore-Arm is carried behind the Back.

842. It likewiſe pulls the Arm directly backward without moving it round its Axis. But neither this Muſcle nor the Latiſſimus Dorſi can perform this ſimple Motion, becauſe of the incurvated Direction of their Tendons, without the aſſiſtance of other Muſcles, which like Antagoniſts, prevent the Rotation already mentioned; and of this number is the Teres Minor, as we ſhall ſee preſently.

843. The nearneſs of the Tendon of this Muſcle to that of the Latiſſimus Dorſi deſerves our Attention. They are both inſerted according to their breadth, in the ſame Line, along the Edge of the bony Channel of the Os Humeri, oppoſite to the Inſertion of the Pectoralis Major in the other Edge of the ſame Channel. Theſe two Tendons croſs each other in the ſame Plane, that of the Teres Major running obliquely from above downward, and that of the Latiſſimus Dorſi, obliquely from below upward.

844. By this diſpoſition, theſe two Tendons reſemble in a great meaſure, the Duplicature or Fold of the Tendon of the Pectoralis Major; and therefore the Teres Major may become a particular Antagoniſt to the ſuperior Portion of the Pectoralis Major; and the Latiſſimus Dorſi to the inferior Portion; and both Muſcles taken together may be a common Antagoniſt to the Pectoralis Major, when that whole Muſcle acts at the ſame time.

845. I observed N° 198. 204. that theſe two Tendons were bound down by a Ligamentary Frænum, which from the Inſertion of the Subſcapularis runs down below that of the Teres Major; and that this Frænum covers the two Tendons and braces them down cloſe to the Bone. The uſe of this Frænum ſeems to be to prevent the ſeparation of the two Tendons from the Edge of the Groove in violent Rotations of the Arm.

846. The Teres Major may likewiſe move the Scapula on the Os Humeri, by drawing the inferior Angle downward and bringing it nearer the Arm; but in order to this, the Arm muſt be kept immoveable by ſome conſiderable Force or Reſiſtance; as when in ſtanding with the whole Arm hanging down, the Hand ſupports a great Weight. By this Action the Teres Major may likewiſe aſſiſt in raiſing the Shoulder, or in hindering it from ſinking.

*Coraco-Brachialis.*

847. The Coraco-Brachialis brings the Arm to the foreſide of the Thorax, raiſing it at the ſame time; and in this caſe it may be reckoned a Congener or Aſſiſtant to the Pectoralis Major in great Efforts; and may perform the ſame Motion by itſelf, when no great Force is neceſſary; as when the whole Arm hangs down, and is moved backward and forward like a Pendulum, the Motion forward being performed by the Coraco-Brachialis, and the Motion backward by the Teres Major, its Antagoniſt.

848. This Muſcle may likewiſe move the Scapula on the Os Humeri kept firmly depreſs'd, as when ſitting in a Chair we take faſt hold of the Edge of it with the Hand. In this caſe the Coraco-Brachialis may bring the Acromium downward, and the inferior Angle of the Scapula, near the Vertebræ. It ſerves likewiſe to bring the Arm to its former Situation, after it has been turned by the Latiſſimus Dorſi in order to apply the Hand to the Back; and then it turns the Os Humeri upon its Axis in a contrary Direction to that given it by the other Muſcle.

*Supra-Spinatus.*

849. The Supra-Spinatus is commonly ſuppoſed to join with the Deltoides in lifting up the Arm; this Muſcle beginning that Action, and the Deltoides continuing it. But beſides that this Muſcle is very ſmall, it ſeems to be too near the Articulation of the Head of the Os Humeri, to be able to raiſe the whole upper Extremity, which is of a conſiderable Weight and Length. It has however two other very remarkable Uſes, when the Arm is raiſed from the Thorax to the Head by the Action of the Deltoides.

850. To underſtand theſe Uſes it muſt be remembered (1.) That the Cartilaginous convex part of the Head of the Os Humeri is much larger than the Glenoide Cavity of the Scapula. (2.) That the moſt ſuperior part of this Convexity lies out of the Cavity when the Arm is depreſſed or near the Ribs. (3.) That the Orbicular Ligament of the Joint is very broad, being proportioned to the diſtance between the Edges of the convex part of the Head of the Os Humeri, and of the Glenoide Cavity of the Scapula; and that therefore it cannot check the Os Humeri in any of its Motions.

851. From thence it is plain, that the ſtrong Deltoide Muſcle in the firſt inſtant of its Action to raiſe the Arm, would thruſt the Head of the

Os Humeri upwards out of the Cavity; if ſomething did not ſupply the place either of a bony Fulcrum or Ligamentary Frænum. The Arch of the Acromium is of no uſe in this caſe, for the Bone muſt be firſt luxated, before it can reach ſo far, and the neighbouring parts muſt ſuffer a Friction, and even a Contuſion, which would be very prejudicial.

852. It is likewiſe plain that the broad Orbicular Ligament would be very apt to be intangled and bruiſed between the Edges of the two articulated Bones, were not this inconveniency prevented by ſome means or other; becauſe it is not elaſtick enough to contract of itſelf in proportion as theſe two Edges approach each other.

853. The Supra-Spinatus anſwers both theſe ends. When it contracts its Tendon, which runs over the convex part of the Head of the Os Humeri, to be inſerted in the upper Surface of the great Tuberoſity, it preſſes very ſtrongly on the Head of the Bone, thereby ſupplying the Place of a Fulcrum, and hindering the Head to riſe, during the beginning of the Action of the Deltoides; and in this Action, it is aſſiſted by the Ligamentary annular Rope mentioned in the Deſcription of the freſh Bones N° 250.

854. I find likewiſe in this Muſcle a ſingular contrivance to prevent the ſecond inconveniency. Its Tendon is a kind of Band, which adheres cloſely to the outſide of the orbicular Ligament; and when we examine it narrowly, we obſerve that ſeveral of its Fibres do not go ſo far as the Head of the Os Humeri, but are gradually inſerted in the outer Surface of the Ligament. Theſe Tendinous Fibres are continuous with thoſe which lie neareſt the Bone or Bottom of the Supra-Spinal Cavity of the Scapula.

855. This Portion may therefore be reckoned a diſtinct Muſcle belonging to the orbicular Ligament, notwithſtanding of its cloſe Union with the other Portion, which is inſerted in the Os Humeri. And indeed we might very juſtly eſtabliſh a new Species of Muſcles by the Name of Articular Muſcles, which belong chiefly to the Capſular Ligaments of thoſe Joints which have large degrees of Motion; ſeveral examples of which we ſhall meet with hereafter.

856. The Mechaniſm of this kind of Muſcles conſiſts in this. The Extremities of the Tendons are inſerted very obliquely in the Surface of the Ligament, and the Fibres take up a great deal more Space there, than in the Body of the Tendon; and they are commonly the innermoſt, or deepeſt and ſhorteſt Portions of the ordinary Muſcles inſerted near the Articulations.

857. The uſe of theſe Muſcles, or Portions of Muſcles is to pull the orbicular Ligaments uniformly, and thereby to prevent their running into irregular Folds, and their being intangled between the two articulated Bones.

*Infra-Spinatus.* 858. The Infra-Spinatus being inſerted by its Tendon in the middle Surface of the great Tuberoſity of the Os Humeri, muſt perform different Motions according to the different Situations of that Bone. If it acts while the Arm hangs down, parallel to the Trunk of the Body, it may move the Os Humeri round its Axis from before outward, and conſequently, if the

Fore-Arm be at the ſame time bent, it will turn the Hand from the Body.

859. If while the Arm is kept raiſed by the Deltoides, the poſterior Portion of that Muſcle draws the Arm backward; the Infra-Spinatus has the ſame uſe with reſpect to the orbicular Ligament, as the Supra-Spinatus already deſcribed. And as theſe two Muſcles adhere cloſely by the Edges of their Tendons, they may in ſome meaſure co-operate in their Action on that Ligament.

860. When the Arm raiſed in the manner already ſaid, is ſtrongly pulled forward by the Pectoralis Major, a conſiderable Force is neceſſary to prevent the Head of the Os Humeri from being thrown backward out of the Glenoide Cavity. The Structure of the Infra-Spinatus and the number of its Fibres, which is much greater than in the Supra-Spinatus, fit it for anſwering this purpoſe; in which it is likewiſe aſſiſted by the flat, broad, thin Ligament mentioned in the Deſcription of the freſh Bones N° 250. This Muſcle may likewiſe aſſiſt the Teres Major in great Efforts.

*Subſcapularis.*

861. The uſe commonly aſcribed to the Subſcapularis, of preſſing the Arm againſt the Ribs, from which it has the Name of *Porte feuille* in *French*, is without foundation. When the Arm hangs down in its natural Situation, this Muſcle may turn it round its Axis, from without forward, as it happens, when in this Situation we beat the Breaſt with the Fore-Arm bent; and it likewiſe ſtrongly aſſiſts the Latiſſimus Dorſi, when we turn the Hand behind the Back.

862. When the Arm being raiſed, we move it backward, as in giving a back ſtroke with the Elbow or Fiſt; the Subſcapularis hinders the Head of the Os Humeri from being luxated forward; for which purpoſe it is well fitted both by its Structure and number of its Fibres, this Motion being ſometimes performed with great Violence.

863. It may likewiſe, by means of the nearneſs and lateral union of its Tendon with that of the Supra-Spinatus, aſſiſt that Muſcle in keeping the Head of the Os Humeri in the Glenoide Cavity, when the other Extremity of the Bone is raiſed.

*Teres Minor.*

864. The Teres Minor may turn the Arm when depreſſed round its Axis, from before outward; as it happens when the Fore-Arm being bent and applied to the lower part of the Breaſt, is removed from thence, without moving the Elbow from the Side. This Rotation is in a contrary Direction to that performed by the Subſcapularis and Teres Major.

865. This Muſcle may likewiſe pull the Arm directly backward, whether raiſed or depreſſed; but in order to this, the Subſcapularis muſt act at the ſame time as a Moderator to prevent the Rotation. The Co-operation of Muſcles is neceſſary in all particular Motions, but in ſome more than in others.

### § 3. *Uſes of the Muſcles which move the Fore-Arm on the Os Humeri.*

*Biceps.*

866. The Biceps which I likewiſe name Coraco-Radialis, becauſe one of its two ſuperior Inſertions is in the Coracoide Apophyſis, the other near the Baſis of that Apophyſis, moves the Fore-Arm in two different manners; that is, it bends both Bones, and turns the Radius upon the Ulna; performing both Motions by its Inſertion in the Radius alone. It likewiſe moves the Os Humeri on the Fore-Arm, the Scapula on the Os Humeri, and the Os Humeri on the Scapula.

867. These five Uſes belong to this Muſcle, though it is commonly limited to that of bending the Fore-Arm; and to theſe we may add a ſixth, by means of the Paſſage of one of its ſuperior Tendons over the Articulation of the Os Humeri with the Scapula, through a Ligamentary Vagina which ſerves as a Frænum, and may be looked upon as an Annular Ligament produced.

868. When it bends the Fore-Arm upon the Os Humeri, the Scapula muſt be kept ſteady by the Muſcles which move it on the Trunk; and in this Function it is a Congener or Aſſiſtant to the Brachialis, which is inſerted in the Ulna; and when the Brachialis becomes incapable of acting by a Wound or any other Diſeaſe, the Biceps alone may perform the Flexion of the Fore-Arm, by being inſerted in the Radius, and by the Connexion of that Bone with the Ulna.

869. To be ſatisfied that it turns the Radius, and performs the Motion called Supination, we need only conſider the manner of its Inſertion in the Tuberoſity of the Radius, already deſcribed, and then look on a Skeleton: And even without theſe Aſſiſtances the following Experiment will prove this Uſe.

870. If when the Fore-Arm is moderately bent, and in a pronated Situation, we perform the Motion of Supination with the Hand, and lay the other Hand on the Biceps at the ſame time, we will perceive it to ſwell and grow hard in proportion as the Supination advances. This Muſcle is therefore a true Supinator.

871. The third Uſe of the Biceps which is to move the Os Humeri on the Fore-Arm, cannot have Place till the Fore-Arm is fixed by ſome exterior Force, as when we hold the Branch of a Tree with the Hands, the Arm being extended, and afterwards bend the Arm in order to climb. In this caſe, part of the Flexion is performed by the Motion of the Os Humeri on the Fore-Arm. And though this whole Action is not owing to the Biceps, yet it as really contributes to it, as the Brachialis.

872. The fourth Uſe of the Biceps is to move the Scapula on the Os Humeri. In order to this the whole Arm muſt be kept fixed much in the ſame manner as was mentioned in deſcribing a like uſe of the Coraco-Brachialis; whether this be done by any exterior Reſiſtance applied to the Fore-Arm or Hand; or by preſſing the two Hands ſtrongly againſt each other behind the lower part of the Back. In theſe caſes, the Contraction

of theſe Muſcles will draw down the Acromia, and bring the Baſes of the Scapulæ nearer each other.

873. The fifth Uſe of this Muſcle is to move the Os Humeri on the Scapula, by raiſing it much in the ſame manner as is done by the Coraco-Brachialis. The manner how this is performed is eaſily conceived; as alſo that it is done moſt readily when the Fore-Arm is extended.

874. The particular Uſe of the Tendon which paſſes through the Ligamentary Vagina, over the Articulation of the Scapula with the Os Humeri, is to co-operate with the Tendon of the Supra-Spinatus in hindering the Head of the Os Humeri from getting out of the Glenoide Cavity, in the firſt Efforts of the Deltoides to raiſe the Arm.

875. Though this Tendon of the Biceps be very ſmall, and though it paſſes over a very ſmooth poliſhed convex Surface, yet it cannot ſlip to either ſide, becauſe of the thick Vagina which lies between the two Tuberoſities of the Head of the Os Humeri, and there chiefly confines it. Beſides, in proportion as the Arm is raiſed, that part of the Tendon which paſſes over the Joint becomes gradually ſhorter, becauſe the Frænum approaches by the ſame degrees, to the place where it is inſerted.

*Brachialis.*

876. The Brachialis ſerves to bend the Fore-Arm on the Os Humeri, by its Inſertion in the Ulna, and by the Connexion of that Bone with the Radius. It ſerves alſo to move the Os Humeri on the Fore-Arm.

877. The ſmall lateral Portions of the lower Extremity of the fleſhy Body of this Muſcle, and the fleſhy Fibres between theſe Portions, neareſt the Bone, are very ſhort, and ſeem to make a diſtinct Muſcle, which does not reach to the Ulna; but is inſerted in the Capſular Ligament of the Joint of the Elbow.

878. These Inſertions in the Ligament are very apparent in many Subjects, and their Uſe ſeems to be much the ſame with what I aſcribed to the like Fibres in the Supra-Spinatus, that is to prevent the Ligament from being catched and ſqueezed between the Bones, in great Flexions of the Arm.

*Anconæus Maximus.*

879. The Anconæus Maximus ſerves to extend the Fore-Arm, by bringing the Ulna to a ſtraight Line with the Os Humeri. It ſerves likewiſe to extend the Os Humeri on the Ulna, when the laſt named Bone is fixed by ſome exterior Reſiſtance, as when being laid upon the Ground, we riſe by ſupporting ourſelves on our Hand. In this caſe likewiſe, the Scapula muſt be kept ſteady by the Coraco-Brachialis.

880. It may likewiſe move the Scapula on the Os Humeri by its Inſertion in the Neck of the firſt of theſe Bones, by means of which it may draw the Baſis downward and raiſe the Top of the Shoulder.

881. By its Inſertion in the Scapula, it may likewiſe draw the Arm backward in a more direct Line than can be done by the Teres Major and Minor.

*Anconæi Laterales.*

882. The two lateral Anconæi co-operate with and aſſiſt the Anconæus Maximus in extending the Fore-Arm on the Os Humeri, and the Os Humeri on the Fore-Arm.

*Anconæus Minimus.* 883. The Anconæus Minimus may concur with the other Muſcles of that name, in extending the Fore-Arm on the Os Humeri and the Os Humeri on the Fore-Arm; but its Action does not reach to all the degrees of Flexion of theſe Bones; for when the Fore-Arm is very much bent, if we examine carefully the Situation of this Muſcle, we will find it more diſpoſed to maintain theſe Bones in that Poſture, by co-operating with the Brachialis, than to extend them by aſſiſting the other Anconæi.

### § 4. *The Uſes of the Muſcles which move the Radius on the Ulna.*

*Supinator Longus.* 884. The Supinator Longus was believed to be concerned only in the Motion of Supination, till M. *Heiſter* very juſtly obſerved that it was likewiſe a Flexor of the Fore-Arm. And indeed a very ſmall degree of attention to its Inſertions and Situation, muſt convince us that it is much better fitted for this laſt uſe than for the firſt. For before it can act as a Supinator, the Hand muſt be in the greateſt degree of Pronation, and even then, it can do little more than bring the Radius back to its natural Situation, without compleating the Supination except it be by Jerks. It would therefore be much more properly named Radialis Longus, than Supinator Longus.

885. This Muſcle may bend the Fore-Arm by means of the Connexion of the Radius with the Ulna in ſeveral different Situations, that is, when the Fore-Arm is fully extended, the Radius being either in a Motion of Pronation or Supination, or in a middle Situation between both.

886. On this occaſion it is proper to obſerve, that the Method of examining the Uſes of the Muſcles on dead Bodies, by pulling them in order to move the Bones in which they are inſerted, is very uncertain, except particular care be taken to pull them in their true natural Direction, which is often different from what it appears to be when they are diſſected, by reaſon of the lateral Connexions, Fræna, &c.

887. Supination performed when the Fore-Arm is fully extended, is commonly attributed in part to the Rotation of the Os Humeri, by means of its Articulation with the Scapula, as if this Supination when the Fore-Arm is extended were greater than when it is bent; whereas the difference in Supination is really but very ſmall, though it be very conſiderable in the Motions of Pronation, as we ſhall ſee hereafter.

*Supinator Brevis.* 888. The Supinator Brevis ſeems to have no other Uſe than what is expreſſed by its name; and as it is a ſhort ſmall Muſcle, it muſt be very weak. Its Uſe is chiefly owing to the Obliquity of its Fibres; but ſtill neither this nor the former Muſcle would be able to perform Supination, where a great Force is required, without the aſſiſtance of the Biceps, which is the moſt powerful of all the Supinators, and the chief Actor in this Motion, as I have already proved.

*Pronator Teres.* 889. The Pronator Teres can have no other Action but that of Pronation, in the different Situations of the Radius, whether that Bone be in a middle ſtate between Pronation and Supination, or in the greateſt degree of Supination; and in this caſe, though it is but a ſmall weak Muſcle, it overcomes the Supinator Longus.

*Pronator Quadratus.*

890. The Pronator Quadratus is capable of no other Motion but Pronation, and it acts with much more Force than its Congener the Pronator Teres; both becauſe of the Number and Direction of its Fibres, and becauſe it acts upon the Radius near the lower Extremity, where its Effects in Pronation are much greater than if it acted near the Head of that Bone. The Fibres lie almoſt in the ſame Direction in which the Bone moves; and in this it has the advantage not only over the other Pronator, but over all the Supinators, the Biceps itſelf not excepted.

891. The Fibres of which this Muſcle is compoſed are ſo diſpoſed as that the longeſt adhere to the internal Angles of both Bones of the Fore-Arm; the ſhorteſt lie neareſt the Interoſſeous Ligament, and the intermediate Fibres are longer or ſhorter according to their greater or leſs diſtance from the Ligament.

892. By theſe different degrees of length, the whole number of Fibres is advantageouſly diſpoſed, and their Action rendered uniform. In the greateſt degree of Supination, the Extremity of theſe Fibres inſerted in the two Bones make a very oblique Plane, which becomes almoſt ſtreight in the greateſt degree of Pronation. We ſhall have other Examples of this kind of Mechaniſm hereafter, and it ſhall then be explained and accounted for.

*Remarks on the Motions of Pronation and Supination.*

893. The Motions of Pronation and Supination are commonly attributed to the Radius alone; and the Ulna is believed to have no other ſhare therein, than to ſerve as a Fulcrum or Baſis on which theſe reciprocal Turns or Rotations of the Radius are made; and laſtly, theſe Motions are ſaid to be the effects of four Muſcles, or at moſt of five, the Biceps being included.

894. Anatomists likewiſe pretend that they have ſeen others demonſtrate; that they have demonſtrated themſelves; and that they are able at any time to demonſtrate both on the Skeleton and on freſh Subjects, theſe two reciprocal Motions, without any Motion in the Ulna; and they have even gone ſo far both in publick and private, as to make Experiments on their own Arms, to prove that the Radius alone performs theſe Motions, and that the Ulna has no ſhare in them.

895. All this notwithſtanding, I have obſerved and demonſtrated to the Royal Academy of Sciences, that in theſe Motions, when free and unconſtrained, the two Bones of the Fore-Arm move always at the ſame time. Thus, for inſtance, when we turn the Radius toward the Breaſt in Pronation, the Ulna is at the ſame time turned from the Breaſt; and when we turn the Radius from the Breaſt in Supination, the Ulna is at the ſame time brought nearer it, ſuppoſing in both theſe Motions that the Fore-Arm is bent.

896. In theſe Motions the Radius rolls ſimply from one ſide to the other; its Extremity in a compleat Pronation or Supination, deſcribing a kind of Semi-Circle; and at the ſame time the Extremity of the Ulna

moving in a contrary Direction, deſcribes another Semi-Circle. Thus in Pronation we raiſe the Extremity of the Ulna, and remove it from the Breaſt at the ſame time; and in Supination we firſt depreſs it, and then raiſe it again, as it is brought nearer the Breaſt.

897. NEITHER is this all; for theſe ſmall Motions of Raiſing and Lowering, of Adduction and Abduction in the Extremity of the Ulna, cannot be brought about without the Rotation of the Os Humeri, becauſe of the Ginglymus, by which theſe two Bones are articulated. Therefore in all unconſtrained Pronations and Supinations, three Bones muſt move, and all the Muſcles concerned in theſe Motions muſt act; and likewiſe during this Action, the Scapula muſt be kept fixed.

### § 5. *Uſes of the Muſcles which move the Carpus on the Fore-Arm.*

898. THE Motion of the Carpus is made principally on the Extremity of the Radius; and on the Ulna, only by the Intervention of the Inter-articular Cartilage or Cartilaginous Production of the Radius. We are not to have regard only to the Carpus in general in theſe Motions, becauſe ſome of them relate alſo to the Metacarpus, and others to particular Bones of the Carpus. The Motions of the Carpus affect likewiſe the whole Hand which is thereby carried different ways and put in different Situations.

899. THE chief Motions of the Carpus are expreſſed by Terms not altogether proper, but which may be retained, as having been long in uſe, provided they be well explained to thoſe who are not accuſtomed to them. Turning the Hand toward the inſide of the two Bones of the Fore-Arm is called bending the Wriſt; and the Wriſt is ſaid to be extended when the Hand is turned toward the outſide of the Fore-Arm. When it is turned toward the Radius alone, that Motion is termed Adduction with regard to the Os Humeri; and Abduction in the ſame ſenſe, is when the Hand is turned toward the Ulna alone.

900. THESE Motions are attributed to four Muſcles; the Ulnaris Internus, Radialis Internus, Ulnaris Externus, and Radialis Externus, or Bicornis. Flexion is performed by the two internal Muſcles; Extenſion by the two External; Abduction by the two Ulnares, and Adduction by the two Radiales.

901. THESE Muſcles may likewiſe ſucceſſively perform ſeveral ſubaltern or oblique Motions of the Carpus and Hand, by the Combination of two principal or direct Motions. Thus, the Radius being fixed in its natural Situation between Pronation and Supination, we may by a Motion of Flexion and Abduction together, turn the Hand obliquely, and at the ſame time partly towards the Fold of the Arm, and partly toward the external Condyle.

902. THESE combined Motions cannot however be performed with near ſo much freedom as the ſimple Motions of Flexion, &c. becauſe of the oblong Figure of the Joint of the Wriſt; and the eaſe and readineſs with

which they ſeem to be performed, is owing to the aſſiſtance of the Motions of Supination and Pronation.

*Ulnaris Internus.*

903. When the Ulnaris Internus acts alone, or as the principal Mover, it brings the Hand obliquely toward the internal Condyle, and toward the Olecranum, though with difficulty, for the reaſon already given.

904. When it acts together with the Radialis Internus, it turns the Hand equally towards the two Extremities of the Bones of the Fore-Arm; and thereby moves not only the Carpus in general on the Fore-Arm, but alſo the ſecond Row of the Carpus on the firſt, and the Metacarpal Bones on the ſecond.

905. When it acts with the Ulnaris Externus, it turns the outward Edge of the Hand toward the Olecranum.

*Ulnaris Externus.*

906. When the Ulnaris Externus acts with the Ulnaris Internus, it turns the outer Edge of the Hand toward the Olecranum, as already ſaid.

907. With the Radiales Externi, it turns the Back of the Hand toward the outer Condyle. This Motion is termed Extenſion, but very improperly when applied to the Hand; for the Metacarpus which is naturally bent this way, will be ſtill more bent by the Action of theſe Muſcles. I ſhould chuſe therefore to term this Motion the Inverſion rather than the Extenſion of the Hand. The Carpus indeed may in ſome ſenſe be ſaid to be extended, becauſe the Bones of the ſecond Row, are brought to a ſtraighter Line with thoſe of the firſt.

908. When this Muſcle acts alone, it brings the outer Edge of the Hand obliquely toward the Olecranum and the external Condyle at the ſame time, but this is performed with difficulty, as has been already obſerved.

*Radialis Internus.*

909. The Radialis Internus, together with the Ulnaris Internus has the uſes already mentioned.

910. With the Radialis Externus, it carries the inner Edge of the Hand, or that next the Thumb, towards the Extremity of the Radius, and toward the Fold made by the Ulna and Os Humeri.

911. Alone, it moves that part of the Hand which is next the Thumb obliquely, toward the internal Angle of the Radius, but with the ſame difficulty as the reſt, when they act ſingly.

912. It ſeems likewiſe to deſerve the name of a third Pronator. What firſt gave me a notion of this uſe was the conſideration of the Obliquity of its Direction between its two Inſertions, which is greater in proportion than that of the Supinator Longus, which therefore muſt be leſs fitted for Supination, than the other is for Pronation. I look upon the annular Ligament through which the Tendon of the Radialis Internus paſſes, as a ſort of Inſertion with reſpect to the Direction of the Muſcle, and we plainly perceive the Tendon to be ſtretched in a ſtrong Motion of Pronation.

*Radialis Externus.*

913. The Radialis Externus together with the Radialis Internus, turns the inner Edge of the Hand directly toward the Styloide Apophyſis of the Radius.

914. With the Ulnaris Externus it inverts the Hand, turning the convex ſide of the Metacarpus toward the lower Extremity of the Bones of the Fore-Arm. It likewiſe moves the ſecond Row of the Carpus on the firſt, and thereby increaſes the tranſverſe Fold on the convex ſide of the Carpus, mentioned in the general Obſervations on the Situation of the Bones of the upper Extremity. This Motion likewiſe increaſes the Angle which the Back of the Hand naturally makes with the outſide of the Fore-Arm; and therefore according to the common Language, it would be more properly termed a Flexion outward than an Extenſion.

915. This Muſcle acting alone draws obliquely, and toward the external Angle of the Radius, that Portion of the Hand which anſwers to the firſt Metacarpal Bone and to the Index; but this is done with the ſame difficulty that has been already taken notice of in the other Muſcles.

916. Each of the two Radiales Externi may act ſeparately, and conſequently have diſtinct Uſes, ſince their Tendons having paſſed the Annular Ligament, are inſerted at ſome diſtance from each other; and thereby one of them ſeems to be fitted to co-operate with the Radialis Internus, the other with the Ulnaris Externus; and they both ſerve conjointly to keep the Hand in its true natural Situation mentioned in the Deſcription of the Skeleton.

*Ulnaris Gracilis.* 917. The Ulnaris Gracilis, commonly called Palmaris Longus, ſeems to be an Aſſiſtant to the Ulnaris and Radialis Interni in bending the Wriſt; and it ſeems likewiſe particularly to aſſiſt the Radialis Internus in the Motion of Pronation.

*Metacarpius* 918. The Metacarpius ſerves to turn the fourth Bone of the Metacarpus toward the Thumb, and at the ſame time to increaſe the Convexity of the Back of the Hand, which is called making *Diogenes*'s Cup. The fourth Bone thus moved carries the third along with it by reaſon of their Connexion, which ſtill augments the Hollow on one ſide and the Convexity on the other.

## § 6. *Uſes of the Muſcles which move the Fingers.*

*Perforatus.* 919. The Perforatus ſerves to bend the ſecond Phalanges of all the Fingers except the Thumb; and the particular Muſcles of which it is made up, may act ſeparately, by reaſon of their diſtinct Inſertions in theſe Phalanges. The Union of the fleſhy Bodies by middle Tendinous Septa may have ſeveral uſes, the chief of which is, that theſe Septa being very broad and thin, give Inſertion to a great number of fleſhy Fibres in a very ſmall compaſs, and thereby ſupply the place of four large Tendons, which would have taken up much more room; but by this Union, theſe four Muſcles are more diſpoſed to act jointly than ſeparately.

920. They not only bend the ſecond Phalanges on the firſt, but alſo the firſt on the Metacarpal Bones, and the Metacarpus and Carpus on the Fore-Arm. To conceive the Mechaniſm and Force of theſe Muſcles, which is very great and neceſſary in certain circumſtances, we muſt call to

mind an Obſervation already made concerning the Muſcles of the Scapula; that every Muſcle which can move a Bone in any given Direction, is likewiſe able with the ſame Force to keep it immoveable in any Situation againſt whatever tends to move it in a contrary Direction. The following Examples will ſufficiently illuſtrate this Obſervation.

921. It is by bending the Fingers that we raiſe the greateſt Weights, that Sailors pull large Oars, that Printers turn the Screws of their Preſſes, and that Climbers ſupport their whole Bodies, even with an additional Burden upon them. It is by means of the Fingers when bent, that we tear, pull up, bruiſe, &c. things that require a very great Force to tear, pull up, or bruiſe them.

922. I observed in the beginning of this Deſcription of the Muſcles N° 54, 55. that the ſtrength of Muſcles depends on the multitude of their fleſhy Fibres, and the extent of their Motions, on the length of theſe Fibres; and conſequently wherever Strength is more neceſſary than large degrees of Motion, there we find the Fibres of Muſcles proportionably increaſed in number; and wherever there is more occaſion for a large degree of Motion than for Strength, the fleſhy Fibres are of a proportionable length.

923. In the Perforatus we meet with both theſe Contrivances, a great number of Fibres for ſtrength of Motion, and a great length of Fibres for extent of Motion. The different Tendinous Septa ſerve to give Inſertions to a number of moving Fibres ſufficient for the Strength required in the caſes already mentioned.

924. Large degrees of Motion are likewiſe ſometimes very neceſſary in this Muſcle, as for inſtance, when we bend the Fingers at the ſame time that the Metacarpus and Carpus are bent on the Fore-Arm; and in this caſe certain Faſciculi of Fibres are chiefly imployed, which appear to be longer than the reſt.

925. The particular uſe of the Tendons of this Muſcle will be better underſtood with that of the Perforans.

926. The Perforans bends particularly the third Phalanges in which it is inſerted; and by the ſame Motion it may likewiſe bend the firſt and ſecond Phalanges. We may apply to this Muſcle all that has been ſaid concerning the Tendinous Septa in the Perforatus, and concerning its Action, which is ſometimes common to all the four ſubaltern Muſcles, ſometimes peculiar to one or more of them. *Perforans.*

927. It may likewiſe be eſteemed an Aſſiſtant to the Ulnaris and Radialis Interni in great Efforts; and theſe Muſcles may reciprocally be looked upon as Aſſiſtants to the Perforatus and Perforans.

928. Each of theſe four Tendons paſſes under a diſtinct Annular Ligament as under a Pulley; for having accompanied that of the Perforatus through the great Ligament of the Carpus, through the Furcæ of the Aponeuroſis Palmaris, and through the Ligamentary Vaginæ of the firſt Phalanx, and having paſſed through the Slits of the Perforatus, it leaves

this Tendon, and continues its courſe to the third Phalanx through the Ligamentary Vagina of the ſecond.

929. In its Paſſage through the Slit of the Perforatus, it is liable to no Compreſſion even in the moſt violent Efforts of that Muſcle. The reciprocal Contorſions of the two flat Portions of the Fiſſure and their crucial Inſertion in the flat ſide of the third Phalanx, hinder the little oblique Grooves mentioned in the Deſcription, from cloſing, and the two lateral Portions of the Fiſſure from coming together, even after the Tendon of the Perforans has been removed. And the more this part of the Tendon is pulled, the more perfectly does this Fiſſure form a ſort of Channel with ſolid Sides, and with the two Ends cut obliquely. All this I demonſtrated in the Royal Academy on a freſh Subject, and I imitated it artificially with a Ribbon.

930. Without ſuch an artful Structure as this, the Tendon of the Perforans would have been continually expoſed to Compreſſions and Contuſions by the ſides of an ordinary Fiſſure; and without paſſing through the Tendon of the Perforatus, it could not have been inſerted in the middle of the flat ſide of the third Phalanx, but near one of the Edges.

931. In the Inſertion of theſe two Tendons of the Phalanges, we may obſerve ſtill a further contrivance. This Inſertion is Angular in both, that is, the Extremities of the Tendons are not inſerted according to their breadth, in a tranſverſe Line, but the ſides of their breadth make an Angle with the middle. I omitted this circumſtance in the Deſcription, for fear of running out to too great a length, a Treatiſe which is deſigned more for inſtruction than for curioſity.

*Extenſor Digitorum Communis.*

932. The Extenſor Digitorum Communis ſerves to extend the four Fingers, to keep them in any degree of Extenſion, and to moderate their Flexion in all the determinate degrees of Action of the Perforatus and Perforans. The Compoſition of the Fibres of this Muſcle, and its Diviſion into ſeveral ſubaltern Muſcles, are much the ſame with what we have already ſeen in the two former. Each of theſe ſubordinate Muſcles may act ſeparately, but with more difficulty than the other two, becauſe of the collateral Series between the Tendons.

933. The particular Uſe of theſe communicating Portions, is to move the Fingers laterally, when extended, to draw them nearer or to a greater diſtance from each other, and alſo to ſerve as Fræna inſtead of Vaginæ. Theſe Motions being unneceſſary when the Fingers are bent, the Perforatus and Perforans have none of theſe communicating Portions.

934. Each Tendon ſerves to extend a whole Finger, that is, all the three Phalanges together; and likewiſe each Phalanx by itſelf, though not with the ſame Facility. The three Phalanges being bent, we can eaſily extend the firſt without the other two, but it is difficult to extend the ſecond Phalanx without extending the third.

935. The contrivance for the general Extenſion of the three Phalanges by one Tendon, conſiſts chiefly in the Rhomboidal Fiſſure in that Tendon on the ſecond Joint, or that of the ſecond Phalanx with the firſt, and in

the Tendinous Expanſions on the ſides of the Baſes of the firſt Phalanx. To theſe we muſt add a ſhort Tendinous Production from the inſide of the Tendon near the firſt Angle of the Rhomboidal Fiſſure, inſerted in the Baſis of the ſecond Phalanx. This Production I omitted in the Deſcription.

936. The lateral Expanſions extend the firſt Phalanx, the Production juſt mentioned extends the ſecond, and the laſt Angle of the Rhomboidal Fiſſure, the third; two other Angles being kept ſeparate by Auxiliary Muſcles, of which hereafter.

937. The difficulty we find in extending the ſecond Phalanges without extending the third, and in extending the third without the ſecond, is partly owing to the two ſtrong Flexors inſerted in theſe Phalanges, which are ſeldom contracted or relaxed ſeparately without a particular Habit; and it is for the ſame reaſon that we cannot eaſily bend one of theſe Phalanges without bending the other, except we have been long accuſtomed to it.

*Extenſores Indicis & Minimi Digiti Proprii.*

938. The proper Extenſors of the Fore and Little Fingers are Aſſiſtants to two ſubaltern Muſcles of the Extenſor Communis that go to theſe Fingers, which conſequently we extend ſeparately with more eaſe, than either of the other two. Theſe Muſcles likewiſe ſerve to bring the Fingers in which they are inſerted near the other Fingers.

939. We may be convinced of this laſt Uſe, by touching theſe Muſcles when we hold our Fingers cloſe together, or move them laterally, whether extended, or in any other unconſtrained Poſture between Extenſion and Flexion. The ſame Experiment may be made with relation to the Middle and Ring Fingers.

*Remarks on the Situation of the long Muſcles which lie upon the Fore-Arm.*

940. Among the long Muſcles which cover the Bones of the Fore-Arm, thoſe which extend the Carpus and Fingers are fixed in the outer Condyle of the Os Humeri, or near it on the ſame ſide. Thoſe which bend the ſame Parts, are fixed in the internal Condyle, or near it on the ſame ſide.

941. This Diſpoſition is very favourable to the Action of the Pronators and Supinators, which otherwiſe muſt have been obſtructed, and theſe Muſcles muſt likewiſe have hindered the Action of the Flexors and Extenſors; and they would mutually have been expoſed to Contuſions and Bruiſes.

942. For were the Flexors fixed on the ſide of the external Condyle, they muſt croſs over the Radius, becauſe of their Inſertions near the Palm of the Hand; and if the Extenſors were fixed near the internal Condyle, they muſt croſs over the Ulna in Pronation, and in that caſe could not act freely.

*Flexor Pollicis Longus.*

943. The Flexor Pollicis Longus ſerves chiefly to bend the third Phalanx of the Thumb in which it is inſerted by the Extremity of its Tendon. It likewiſe bends the ſecond Phalanx, by virtue of the Ligamentary Vagina through which it paſſes, as through an Annular Ligament.

944. As the fleſhy Body of this Muſcle is very thin and narrow, it does not at firſt ſight appear to bear a ſufficient Proportion to the great Force with which we conſtantly find it to act. But when we conſider its Structure more narrowly, we find therein a beautiful example of a very great number of Fibres artfully placed in a ſmall Space, only by the oblique Diſtribution thereof; as I obſerved in the beginning of this Treatiſe of the Muſcles N° 14. 54. 55.

*Extenſores Pollicis.* 945. The firſt Extenſor of the Thumb alone, when there are three, or a Portion of the firſt, when there are but two, ſerves to draw the firſt Phalanx from the Palm of the Hand, or to keep it a diſtance therefrom.

946. The word Extenſion made uſe of to expreſs this Motion is very improper; for the firſt Phalanx of the Thumb in its natural Situation makes an Angle with the Radius, and conſequently is in a ſtate of Flexion. It ought therefore more properly to be ſaid to be extended when it is drawn near the Palm of the Hand. However the common Terms may ſtill be retained, if we be previouſly made acquainted with their true meaning, as I already obſerved, ſpeaking of the Uſes of the Ulnaris and Radialis Externi.

947. The ſecond of theſe Muſcles when there are three, or the ſecond Portion of the firſt, when there are but two, ſerves to extend the ſecond Phalanx on the firſt, and this Motion is a true Extenſion.

948. The third, when there are three, or the ſecond, where there are but two, extends the third Phalanx on the ſecond.

949. When they act all together, they aſſiſt each other by the graduated Inſertions of their ſmall ſubaltern Tendons.

950. These Muſcles may likewiſe aſſiſt in the common Action of the two Radiales, that is in bringing the greater or inner Edge of the Hand towards the convex ſide of the Radius; and they probably have ſome ſhare likewiſe in the Motion of Supination.

### § 7. *Uſes of the ſmall Muſcles inſerted in the Bones of the Metacarpus and Fingers.*

*Thenar.* 951. The Thenar by its Inſertion in the firſt Phalanx of the Thumb, ſerves to draw it from the firſt Bone of the Metacarpus, more or leſs directly, as one of its Portions acts more than the other, or as they both act equally.

952. By the Inſertion of the large Portion in the Baſis of the ſecond Phalanx by the Intervention of the Seſamoide Bone of the ſame ſide, it may bend this Phalanx laterally on the firſt, and thereby bring the Thumb to a greater diſtance from the Index. Neither does this diſtance hinder it from ſometimes bending, and ſometimes extending the Thumb in the ordinary manner.

953. When the ſmall portion acts alone, it may give the ſecond Phalanx a ſmall degree of Rotation on the firſt, theſe two Bones not being articulated by a Ginglymus.

954. The Meſothenar moves the firſt Phalanx of the Thumb towards the Hollow of the Hand, more or leſs obliquely, as it acts either alone or with the large Portion of the Thenar, or even with the Antithenar. By its Inſertion in the Seſamoide Bone of the ſecond Phalanx, it likewiſe moves that Phalanx on the firſt, and thereby aſſiſts the Flexor Longus. *Meſothenar.*

955. The Antithenar moves the firſt Phalanx of the Thumb toward the firſt Bone of the Metacarpus, and thereby preſſes the Thumb laterally againſt the Index. This Motion becomes more or leſs oblique by the Cooperation of the Meſothenar. *Antithenar.*

956. The Hypothenar Minor ſerves to ſeparate the Little Finger from the reſt; which Motion is commonly called Abduction. It likewiſe keeps this Finger ſeparated in all Situations, that is, in all degrees of Flexion or Extenſion. *Hypothenar Minor.*

957. The Interoſſei may have two different Uſes according to their different Inſertions, and the different Situations of the Fingers in which they are inſerted. *Interoſſei.*

958. In general, they aſſiſt the Extenſor Communis by their Inſertions in the lateral Angles of the Rhomboidal Fiſſures; for thereby they act like lateral Ropes, which together with the Tendons of the Extenſor, ſerve to extend the third Phalanx of each Finger.

959. By the ſame lateral Inſertions they perform the lateral Motions of the Fingers, that is, they preſs them all cloſe againſt each other, but do not ſeparate them all, nor move each Finger in particular towards or from the Thumb. In a general ſeparation of all the Fingers, the Interoſſei move only the Middle and Ring Fingers; the Index and Little Finger being ſeparated by other Muſcles. In the Motion of the Fingers toward the Thumb, which is termed Adduction, they act only on three Fingers, the Middle, Ring and Little Fingers. In the contrary Motion or Abduction of the Fingers, they move likewiſe three, viz. the Index, Middle and Ring Fingers.

960. The Uſes of the Interoſſei in particular, whether external or internal, may be different in different Subjects, according to the variety of their Inſertions, and therefore in living Bodies, nothing can be determined about them.

961. According to the Situation in which I have deſcribed them, the firſt and ſecond external Interoſſei perform alternately the Adduction and Abduction of the Middle Finger; the third performs the Abduction of the Ring Finger; that is, moves it toward the Little Finger.

962. The firſt internal Interoſſeus makes the Abduction of the Index or moves it toward the Middle Finger; the ſecond makes the Adduction of the Ring Finger, by moving it likewiſe toward the Middle Finger; and the third performs the Adduction of the Little Finger, or moves it toward the Middle Finger.

963. *HEISTER* in his Compendium Anatomicum publiſhed 1727. p. 316. makes me ſay that the internal Interoſſei by their Inſertions in the Ring and Little Finger, perform the Abduction of theſe Fingers; adding, that he does not conceive how an internal Interoſſeous Muſcle can perform the Abduction of the Little Finger, ſince by that term Anatomiſts underſtand a Motion from the Thumb. He quotes for this, the Memoirs of the Royal Academy for the Year 1720; but it is plain he had not ſeen the *Paris* Edition, and that in that which he conſulted, b had been ſubſtituted for d.

*Semi-Interoſſeus Indicis.* 964. THE Uſe of the Semi-Interoſſeus Indicis is to move the firſt Phalanx of the Index more or leſs directly toward the great Edge of the Metacarpus, by removing it from the Middle Finger. This Motion is not a true Adduction of the Index toward the Thumb. And indeed the terms of Adduction and Abduction are very improper to convey a juſt Idea of the lateral Motions not only of the Index, but of all the other Fingers.

*Lumbricales.* 965. THE Lumbricales by the union of their Tendons with thoſe of the Interoſſei, are Coadjutors to theſe Muſcles, not only in the lateral Motions of the four Fingers, but alſo in bending and extending them. In the lateral Motions, they co-operate according to their Situation in each Subject; and it is poſſible that the variety of their Inſertions anſwers to that of the Interoſſei, ſo that the reciprocal Co-operation continues ſtill to be equal.

966. THEY aſſiſt the great common Flexor to which they are fixed, only in bending the firſt Phalanges; which Motion that Muſcle principally performs by means of the Ligamentary Vaginæ, eſpecially that Portion of them which is next the Metacarpus.

967. THEY may aſſiſt the Extenſor Communis in extending the third Phalanges, together with the Interoſſei, by the concurrence of their Tendons. But here the variety of their Inſertions is likewiſe to be regarded; and in ſome Subjects the want of them in that ſide of the Index next the Thumb, and ſide of the Little Finger furtheſt from the Thumb, may be ſupplied by the proper Extenſors of theſe Fingers.

### § 8. *Uſes of the Muſcles which move the Os Femoris on the Pelvis.*

*Glutæus Maximus.* 968. THE Glutæus Maximus ſerves chiefly by its Poſterior Portion, to extend the Os Femoris and to draw it backward. Neither of the other Glutæi can have this uſe, though it is commonly attributed to all the three. By its anterior Portion, it may co-operate with the reſt in performing the Abduction of the Thigh, that is, in ſeparating it from the other when we ſtand, but when we ſit, it can do this Office only by its Poſterior Portion.

969. BY its Inſertion in the Os Coccygis, it may on ſome occaſions bring it forward, and hinder it from being thruſt too far backward, as in the Excretion of hardened Fæces, or in difficult Births.

970. The Glutæus Medius is commonly but falſely reckoned an Extenſor of the Thigh. Its Uſe is to ſeparate one Thigh from the other, when we ſtand, and that more or leſs directly according to the Action of its Anterior, Poſterior or Middle Portions. In this Situation therefore it is a true Abductor, but by only viewing its Inſertions we may be aſſured that it cannot be an Extenſor. *Glutæus Medius.*

971. When we ſit, the only Uſe of this Muſcle is to perform the Rotation of the Os Femoris about its Axis, in ſuch a manner, that if the Leg be bent at the ſame time it ſhall be ſeparated from the other. This Rotation is not altogether direct, but muſt be more or leſs oblique, becauſe of the crookedneſs of the Bone, and of the Angle which its Head makes with the Body.

972. The Glutæus Minimus has likewiſe been reckoned an Extenſor of the Thigh, but without any foundation. It aſſiſts the Glutæus Medius in the Abduction of the Thigh when we ſtand, and in the Rotation when we ſit. Therefore of theſe three Muſcles commonly called Extenſors of the Thigh, only one deſerves that name. *Glutæus Minimus.*

973. What I have ſaid of the Uſe of theſe Muſcles when we ſtand, will equally hold in all other Situations in which the Thighs are ſtretched out; as for inſtance, when we lie at full length. And what has been ſaid of their Uſes when we ſit, will agree to all other Situations in which the Thighs are bent, as when we lie with the Knees drawn up toward the Abdomen. *Remarks on the Uſes of the Glutæi.*

974. The Glutæi not only perform theſe Motions of the Thigh on the Pelvis, but reciprocally move the Pelvis on the Thighs in the ſame manner. The Glutæus Maximus, for inſtance, not only extends the Os Femoris but ſuſtains the Pelvis on the Thighs, and hinders it from being carried along with the reſt of the Trunk when the Body is inclined forward, while we ſtand; and likewiſe raiſes it, when the reſt of the Body is raiſed.

975. The other two Glutæi likewiſe move the Pelvis on the Thigh, as they move the Thigh on the Pelvis. For inſtance, when we ſtand upon one Leg, the two Muſcles on that ſide draw the Pelvis laterally toward the Thigh, and hinder it from giving way or falling toward the other ſide, whither the Weight of the Pelvis itſelf, and of the other Leg which is not ſupported, endeavours to bring it.

976. The Pſoas bends the Thigh on the Pelvis, or brings it forward. It may likewiſe move the Pelvis on the Thighs, and hinder it from being carried along with the reſt of the Trunk, when the Body is inclined backward while we ſit, having the lower Extremities fixed by ſome external Force. In this Situation it may likewiſe move the Vertebræ of the Loins. *Pſoas.*

977. The Iliacus is a Congener or Aſſiſtant to the Pſoas, in bringing the Thigh forward and upward. It may likewiſe move the Pelvis in the ſame manner with the former. *Iliacus.*

978. The Pectineus is an Aſſiſtant to the two former Muſcles in moving both the Thigh and the Pelvis. It may likewiſe aſſiſt in bringing the *Pectineus.*

Thigh inward, or toward the other, whether it be extended or bent at the ſame time.

*Tricipites.*

979. The three Triceps Muſcles join in the ſame Uſe, that is, to move the Thigh inward, and bring the two Thighs near each other; as when in riding, we preſs the Thighs cloſe againſt the Saddle; when in ſitting, we hold any thing cloſe between the Knees; when we croſs the Thighs; or when in ſtanding, we bring the Legs cloſe together in order to jump.

980. The Uſe of theſe Muſcles is likewiſe to hinder the Thighs from ſeparating more than is convenient, eſpecially in great Efforts and Jerks. This might happen for inſtance, when in mounting a Horſe, or laying the Leg over any Height, we raiſe one Thigh haſtily, and ſupport the Body on the other. It might likewiſe happen by the weight of the Body alone, when in ſtanding we ſeparate both Legs at once, or jump haſtily to one ſide.

981. This Uſe of bringing the Thighs together and hindering their ſeparation, has place in all poſſible Situations of the Body or Thighs, that is in ſtanding, ſitting and lying, and when bent, extended, or turned backward or outward. This ſhews the great neceſſity of providing for this Function, not only by a ſtrong moving Force, but alſo by diſtributing this Force in ſuch a manner as that it may be able to act through almoſt all the degrees of a very long Lever of one kind.

982. The longeſt Portion of the Triceps Tertius being inſerted in the ſide of the inner Condyle of the Os Femoris, ſeems to counterbalance the other Portions which are inſerted more poſteriourly in the Linea Aſpera.

*Pyriformis, Gemelli, & Quadratus.*

983. These four Muſcles called likewiſe by the common name of Quadrigemini, are Congeneres in their Uſes; and theſe have been confined by Anatomiſts to the Rotation of the Os Femoris about its Axis from before outwards. I demonſtrated many Years ago, that they cannot have this Uſe, except when we ſtand or lie at full length; and likewiſe that in ſitting, or when the Thigh is bent in any other Poſture, they carry the Thigh outward, or ſeparate the two Thighs from each other when bent.

984. All the four co-operate in theſe two Uſes of Rotation and Abduction; but they co-operate equally or unequally, according to the different degrees of the Extenſion or Flexion of the Thigh. For inſtance, when we ſtand ſtreight up, they all perform the Rotation equally, but if the Thigh be then carried a little forward, the Pyriformis is more in Action than the Quadratus; and if the Thigh be carried backward, the Quadratus acts moſt.

985. These Muſcles, by means of their Adheſion to the Orbicular Ligament of the Joint of the Hip, may likewiſe ſerve to hinder that Ligament from being ſqueezed between the Bones in the different Motions of the Thigh.

*Obturator Internus.*

986. The Obturator Internus has nearly the ſame Uſes with the Quadrigemini, in making the Rotation of the Thigh when extended, and the Abduction, when bent. But the Mechaniſm of this Muſcle is ſingular in this reſpect, that by the paſſage of its Tendon over the ſmall Iſchiatic

Notch, it acquires a different Direction from that of the Belly or fleſhy Body.

987. This Notch ſupplies the place of a Pulley, over which a Rope is thrown, one end of which is faſtened to a moveable Object which by pulling the other end, may be brought nearer the Pulley. In this the Pulley performs the Office of a fixed Point or Fulcrum with reſpect to the moveable Body; and in like manner the Iſchiatic Notch is a Fulcrum for the Motion of the Thigh by the Obturator Internus.

*Obturator Externus.*

988. The Obturator Externus concurs with the Internus in the ſame Uſes, though in a more ſimple manner, and in a more uniform Direction. It acts chiefly when the Thigh is extended more or leſs; for when the Thigh is bent, it only ſeems to co-operate with the Obturator Internus in its Action on the Orbicular Ligament; becauſe in other reſpects it is rather an Aſſiſtant to the Triceps and performs the Motion of Rotation the other way.

*Muſculus Faſciæ Latæ.*

989. The Muſculus Faſciæ Latæ has been falſely ſuppoſed to be an Abductor of the Thigh; for the Direction of its moving Fibres is very contrary to ſuch a Motion. It is very proper for making a Rotation from before inwards, that is, in a contrary Direction to that made by the Quadrigemini and Obturator Internus; and this Rotation is not ſo much confined as that of the Quadrigemini, becauſe it may have place whether the Thigh be bent or extended.

990. It may likewiſe aſſiſt in the great Efforts of Flexion or Adduction, provided that its different Antagoniſts act as Moderators, according to the different Situations of the Thigh, as ſhall be explained more at length in another place.

## § 9. *Uſes of the Muſcles which move the Bones of the Leg on the Os Femoris.*

991. To be able to conceive the Uſes of theſe Muſcles, we ought firſt to be well inſtructed in all that relates to the Bones concerned, eſpecially their Articulations and intermediate Cartilages, as I have deſcribed them in the Treatiſe of the Skeleton and of the freſh Bones; and in particular I deſire the Reader to review the Deſcription of the Os Femoris, Tibia and Patella.

*Vaſtus Externus, Vaſtus Internus, and Crureus.*

992. The two Vaſti and Crureus ought to be looked upon as a true Triceps, the Uſes of which in relation to the Bones, are only to extend the Tibia on the Os Femoris, and the Os Femoris on the Tibia. The Extenſion of the Tibia on the Os Femoris, happens chiefly when we ſit or lie, and that of the Os Femoris on the Tibia, when we ſtand or walk. All the three Muſcles move the Patella uniformly in the Direction of the Os Femoris, on the Pulley at the lower Extremity of that Bone. The external or broad Portion of this Pulley and of the Patella, anſwers to this Direction, and ſeems to be more expoſed to the Action of theſe Muſcles, than the internal and narrow Portion on which the neceſſary Obliquity of that Pulley depends.

993. The Inſertion of both the Vaſti immediately in the Head of the Tibia, prevents the Patella from being luxated laterally on ſome occaſions, in which the Muſcles may act with more Force on one ſide than on the other, or remain without Action, in which caſe the Patella is looſe and floating.

994. To be convinced of this Inaction, and of the Moveableneſs of the Patella at the ſame time, let us either in ſitting or ſtanding with the Leg extended, reſt the Leg only upon the backſide of the Heel, ſo as that the whole lower Extremity may be ſupported on the Heel and on the Head of the Os Femoris, the Knee and the Body of the Os Femoris reſting on nothing, and the Extenſion being made only by the Weight of the Bones, without any aſſiſtance from the Muſcles. If in this Situation, we lay the Thumb on the Baſis of the Patella and the Fore-Finger on the Apex, and preſs theſe two parts alternately, the Patella will be perceived to be raiſed and depreſſed.

995. In the Deſcription of theſe Muſcles, I forgot an Obſervation which I have made on the Inſertion of ſeveral Fibres immediately in the Capſular Ligament of the Joint of the Knee. I have ſeen theſe Fibres run down, as if they came chiefly from the Crureus; and their Inſertion in the Ligament was oblique and made by degrees. And from hence, I firſt took the hint of that new Species of Muſcles already mentioned in deſcribing thoſe which ſurround the Articulation of the Head of the Os Humeri, of the Ulna, and of the Os Femoris; and in ſome Articulations the Adheſion of the Tendons or Tendinous Fibres ſupplies the place of fleſhy Fibres.

996. By the Inſertion of theſe Muſcles in the Patella, their Line of Direction is removed to a greater diſtance from the Center or Axis of Motion of the Joint, which facilitates their Action, and defends their common Tendon from Compreſſion and Contuſions.

*Rectus Anterior.*

997. The Rectus Anterior by its Inſertion in the Patella is a Congener to the laſt three Muſcles, and ſerves to extend the Leg. By its Inſertion in the Os Ilium, it bends the Thigh and aſſiſts the Pſoas, Iliacus and Pectineus, whether the Leg be extended or bent. It likewiſe moves the Pelvis forward on the Os Femoris, and hinders it from falling back when we ſit.

998. Being partly Penniform and partly Simple, it is capable of ſuſtaining great Efforts, and of producing large Motions; and its Line of Direction which is raiſed to a conſiderable diſtance from the Center of Motion of the Hip and Knee, increaſes theſe Advantages. The particular diſpoſition and largeneſs of its ſecond ſuperior Tendon, anſwer principally to all the degrees of Flexion.

999 The other Tendon commonly deſcribed, would not alone have been ſufficient for that purpoſe; but its Obliquity is convenient for the Extenſion of the Leg, when the Thigh is extended or but little bent. But when the Thigh is very much bent, this Obliquity would remove the ſmall Tendon to too great a diſtance from the Bone, and thereby expoſe it

to be torn off, in the ſame manner as we tear off the Branch of a Tree, by ſeparating it from the Trunk. The Obliquity here mentioned, is with reſpect to the Os Femoris, this ſuperior Tendon lying out of the Direction of that Bone.

*Sartorius.*

1000. The Sartorius performs the Rotation of the Thigh from before, outward, whether extended or bent; being an Antagoniſt to the Muſculus Faſciæ Latæ, and a Congener to the Quadrigemini.

1001. If during this Rotation the Leg be extended, the Toes are turned outward; but if the Leg be bent, it is turned toward the other Leg, as when we lay it over the other Leg or Knee, in the manner that Taylors ſit at work, from whence this Muſcle got the name of Sartorius.

1002. It likewiſe bends the Thigh or raiſes it forward; it moves the Pelvis forward on the Os Femoris, and when the Pelvis reſts on the two Tuberoſities of the Iſchium in ſitting, it keeps it in that Situation. In this Action it is a Congener to the Rectus Anterior, but acts with much more Force, as having its Line of Direction further from the Center of Motion.

1003. Lastly it bends the Leg, whether it performs the Rotation of the Thigh at the ſame Time or not. In this latter Caſe, it is directed by the Co-operation of ſome Congener, or counterbalanced by the Action of the Muſculus Faſciæ Latæ.

1004. The Length and Obliquity of its fleſhy Portion, the paſſage of the inferior Tendon through the Aponeurotic Vagina, the particular Inſertion of this Tendon, and the Extent of the Aponeuroſis which it ſends over the Tibia, contribute very much to theſe different Uſes.

1005. Besides all theſe Uſes, it may in ſome caſes aſſiſt the Popliteus, as ſhall be ſhewn in ſpeaking of that Muſcle.

*Gracilis Internus.*

1006. The Gracilis Internus bends the Leg much in the ſame manner with the Sartorius which it aſſiſts in this Function, but not in that of turning the Leg; and it is more proper to continue the Flexion than to begin it, it being chiefly when the Thigh is turned by the Sartorius, that the Gracilis contributes to this Action.

1007. It may likewiſe aſſiſt the Triceps in the Adduction of the Thigh, which it performs with much more Facility than it begins the Flexion of the Leg without the Rotation of the Thigh. This Facility in all Situations of the Thigh, is procured by the diſtance of the ſuperior Inſertion of this Muſcle from the Joint of the Hip; but it cannot with the ſame eaſe bend the Leg when the Thigh is not turned, for this Reaſon.

1008. While the Thigh is only extended, the Line of Direction of this whole Muſcle is nearly in the ſame Plane with the Axis of Motion of the Knee, and therefore the diſtance of its ſuperior Inſertion gives it no advantage. But when the Thigh is turned round by the Sartorius, the Plane of its Direction changes and croſſes the Axis of the Ginglymus of the Knee, and then the lateral diſtance of its ſuperior Inſertion facilitates its Action on the Leg.

*Semi-Nervoſus.* 1009. The Semi-Nervoſus bends the Leg, and may likewiſe bend the Thigh on the Leg. By its Inſertion in the Tuberoſity of the Iſchium, it likewiſe extends the Thigh on the Pelvis, and carries it backward; and may alſo extend the Pelvis on the Thigh, when it has been inclined forward with the reſt of the Trunk; and conſequently prevent its being carried too far along with the Trunk, when we ſtoop forward, either ſtanding or ſitting.

*Semi-Membranoſus.* 1010. The Semi-Membranoſus has the ſame Uſes with the Semi-Nervoſus. It bends the Leg on the Thigh, and the Thigh on the Leg; it extends the Thigh on the Pelvis, and the Pelvis on the Thigh, and ſuſtains the Pelvis when it is inclined forward. It differs in this one thing from the three Muſcles laſt mentioned, that its Inſertion is not on one ſide but behind the Joint; and for that reaſon it is better diſpoſed both to begin and continue the Flexion of the Leg than they are.

*Biceps.* 1011. The two Portions of the Biceps bend the Leg on the Thigh, and the Thigh on the Leg. The ſuperior Portion likewiſe extends the Thigh on the Pelvis, and the Pelvis on the Thigh. Theſe four Uſes in general are common to this Muſcle with the Semi-Membranoſus, and in ſome meaſure with the Semi-Tendinoſus.

1012. The particular Uſe of the Biceps, and which ſeems to belong more to the ſhort Portion than to the other, is to perform the Rotation of the Leg when bent, by which Motion the Toes are turned outward, and the Heel inward. It has no ſhare in the Rotation of the Leg when extended, which depends entirely on that of the Thigh, the Motions of which, the Leg only follows as if theſe two Bones were cemented together.

1013. The Mechaniſm of the Rotation of the Leg when bent, depends chiefly on the Structure of the Semi-Lunar Cartilages, and on the Situation of the lateral and crucial Ligaments. Theſe Cartilages are hollowed on the upper ſide in proportion to the Convexity of the Condyles of the Os Femoris; and on the under ſide they are flattened in proportion to the Surface of the Tibia. The Lateral Ligaments are not in the middle of each ſide of the Head of the Tibia, but more backward. The Crucial Ligaments are diſpoſed in ſuch a manner, as that in turning the Leg when bent, from before outward, they ſeparate from each other, and in turning it from before inward, they approach each other. See the Deſcription of the Freſh Bones N° 154. 160. 162.

1014. When the Leg is extended or bent, the Semi-Lunar Cartilages perform the Office of Hinges, becauſe the Condyles of the Os Femoris turn in their Cavities; and in this Caſe theſe Cartilages may be conſidered as making in ſome meaſure but one piece with the Tibia. And when the Leg is ſtrongly extended, the Lateral Ligaments by their Situation backward, limit this Extenſion, and hinder the Leg from being bent forward.

1015. In making the two Motions of Rotation with the Leg when bent, the Semi-Lunar Cartilages may be conſidered as being fixed to the

Os Femoris, and that the Tibia ſlides both ways under them. In this caſe, the Lateral Ligaments are very much relaxed, and no ways hinder this Rotation; and the Crucial Ligaments ſeparate from each other, when we turn the Toes outward, the Leg being bent; but they ſtrike againſt each other, when the Toes are turned inward, which ſeems to render the Rotation inward, more confined than the Rotation outward.

1016. These two reciprocal Motions of the Leg when bent, may be compared to thoſe of the Radius on the Ulna. The Rotation inward anſwers to Pronation, and the Rotation outward to Supination. The Biceps of the Tibia may be likewiſe compared to the Biceps of the Fore-Arm, both being Flexors and Rotators; for Pronation and Supination are only two Species of Rotation.

1017. The want of Motion in the Fibula on theſe occaſions, is made up by the Moveableneſs of the Patella; without which the Rotation of the Leg, when bent, would be impoſſible; for in making this Motion, the Patella remains perfectly at reſt on the Condyles of the Os Femoris; the great Ligament only giving way by a ſort of ſmall reciprocal Contorſion of its lower Extremity. It is neceſſary here to review what was ſaid in the Deſcription of the Skeleton.

*Popliteus.*

1018. The Popliteus performs the Rotation of the Leg when bent, in a Direction contrary to that of the Biceps. The Biceps turns the Leg from before outward; the Popliteus from before inward. This Rotation therefore anſwers to the Pronation of the Radius by the Pronator Teres; as that made by the Biceps Tibiæ does to the Supination made by the Biceps of the Arm.

1019. This Muſcle is commonly reckoned among the Flexors of the Leg, but it ſeems very ill contrived for ſuch a Function, becauſe of the Obliquity of its Situation, and becauſe its Inſertion is ſo near the Center of Motion of the Joint. By its Connexion with the Capſular Ligament it may ſerve to prevent its being catched between the two Bones in the Flexions of the Leg.

## § 10. *Uſes of the Muſcles which move the Tarſus and the other Bones of the Foot.*

*Tibialis Anticus.*

1020. The Tibialis Anticus bends the Foot, that is, turns the Point of the Foot toward the Leg; which Motion is performed by the Ginglymoide Articulation of the Aſtragalus with the Tibia and Fibula. It likewiſe bends the Leg on the Foot, or hinders its Extenſion. The firſt of theſe uſes is generally known; and we have an inſtance of the ſecond every time we ſtand or walk. When we ſtand, the Feet being turned directly forward, this Muſcle, like a Frænum, keeps the Leg in Æquilibrio, and hinders it from falling backward. This uſe is ſtill more evident when we walk backward.

1021. By its lateral Inſertion in the Os Cuneiforme Maximum, it moves this Bone in particular over the anterior Extremity of the Os Calcis; by which the Sole of the Foot is turned inward toward the other. This lateral Situation of its Inſertion is the reaſon why it cannot bend the Foot directly, without the help of the Anterior Peronæi; neither can it alone keep the Leg in Æquilibrio when we ſtand on one Foot.

*Peronæus Medius & Minimus.* 1022. The Peronæus Medius bends the Foot, and hinders the Leg from falling back in the ſame manner as the Tibialis Anticus. By its Inſertion in the Tuberoſity of the fifth Metatarſal Bone, it turns the Sole of the Foot outward at the ſame time that it bends it, when it acts without the aſſiſtance of the Tibialis Anticus; the Co-operation of which Muſcle is likewiſe neceſſary to enable it to counterbalance the Force with which the Leg would be carried backward when we ſtand upon one Foot.

1023. The Peronæus Minimus is an Aſſiſtant to the Medius in the Flexion of the Foot, in preſerving the Æquilibrium of the Leg, and in turning the Sole of the Foot outward; neither can it perform the firſt two of theſe Motions uniformly without the Co-operation of the Tibialis Anticus.

1024. The uniform Flexion of the Foot furniſhes an Example of all the three kinds of Levers; of the firſt, when we bend the Foot while off the Ground, in which caſe the Fulcrum is in the Articulation between the two Extremities of the Lever; of the ſecond, when we walk upon the Heels or Toes, for then the Weight is between the Power and the Fulcrum; of the third, when we raiſe a Weight by the Toes, for then the Power is between the Weight and the Fulcrum.

*Gaſtrocnemii & Soleus.* 1025. The Gaſtocnemii and Soleus make a kind of Triceps, and by their common Tendon extend the Foot and keep it extended againſt the ſtrongeſt Reſiſtance. It is by their means that we raiſe the whole Body even with an additional Burden, when we ſtand a Tip-Toes; and that we walk, run and jump. The length of the poſterior Portion of the Os Calcis gives them a great advantage in acting, by removing the Line of their Direction from the Axis of Motion.

1026. The Motions of the Foot performed by theſe Muſcles may be referred to the firſt two kinds of Levers. When we ſtand a Tip-Toes, the Foot repreſents a Lever of the ſecond kind, the Fulcrum being then at one end, the Power at the other, and the Weight between them; and we have a Lever of the firſt kind, when the Leg being fixed, we endeavour to overcome any moveable Reſiſtance with the Toes, or whenever we move the Foot held off the Ground.

1027. These Muſcles not only extend the Foot on the Leg, but likewiſe the Leg on the Foot, as appears evidently when after a moderate Genuflexion, we raiſe our Bodies; for then the Foot remains fixed while theſe Muſcles extend the Leg; and it is here to be obſerved that this Genuflexion is not made by the Action of any Flexors, but only by the Relaxation of the proper Extenſors, according to what was taken notice of in the beginning of this Section N° 51.

1028. The Gaſtrocnemii by their Inſertion in the Os Femoris may in great Efforts move the Leg on the Thigh, and the Thigh on the Leg, as Aſſiſtants to the Biceps, Semi-Membranoſus, Semi-Tendinoſus, Gracilis Internus, and Sartorius. In theſe Motions the ſuperior Extremities of the Gaſtrocnemii croſs under the lower Extremities of the Muſcles laſt named. The fleſhy Fibres of the Gaſtrocnemii are very long, and there is a great diſtance between their two Inſertions; and on this account theſe Muſcles are better fitted for large Degrees of Motion than for Strength.

1029. The Soleus by the Multitude of its fleſhy Fibres and its penniform Structure, is more proper for ſtrong than large Motions, and ſeems principally to ſuſtain the Gaſtrocnemii in the Motions begun by them. The Tendinous Portions of this Muſcle and of the Gaſtrocnemii, though they form a ſtrong Tendon all together, ſeem nevertheleſs to ſlide a little upon each other in the different Flexions and Extenſions of the Foot.

*Tibialis Gracilis vulgo Plantaris.*

1030. From the Deſcription of the Tibialis Gracilis we ſee evidently that it can have no uſe with relation to the Sole of the Foot. The uſe aſſigned to it by others, of extending the Tarſus and thereby aſſiſting the Gaſtrocnemii and Soleus, ſeems to me to be very uncertain, both becauſe of the great Diſproportion in its Size, and the Obliquity of its Courſe. If the Soleus were not covered by the Gaſtrocnemii, the Tibialis Gracilis might be imagined to ſerve as a Frænum in bracing down that Muſcle and hindering it from ſwelling too much; but the ſmall Number and Direction of its Fibres would ſtill render it unfit for that Function.

1031. Till its true Uſe is evidently diſcovered by ſome lucky Obſervation, there is in the mean time ſome ground to think that it hinders the Capſular Ligament of the Knee from being compreſſed in the Flexion of that Joint; both becauſe of its Adheſion to that Ligament, and becauſe of the Obliquity of its Courſe, eſpecially ſince the neighbouring Portion of the ſame Ligament ſeems to receive the ſame aſſiſtance from a Tendinous Expanſion of the Semi-Membranoſus.

*Tibialis Poſticus.*

1032. When the Tibialis Poſticus acts alone, it extends the Foot obliquely inward. When it acts together with the Gaſtrocnemii and Soleus, it changes the ſtreight Direction of their Motion to an oblique one. When it acts with the Tibialis Anticus, the Sole of the Foot is turned more directly inward or toward the other Foot.

*Peronæus Maximus.*

1033. When the Peronæus Longus or Maximus acts alone, it may extend the Foot hanging freely in the Air; but then this Extenſion is obliquely outward. Together with the Gaſtrocnemii and Soleus, it likewiſe changes their Direction to an oblique Extenſion outward.

1034. This Muſcle and the Tibialis Poſticus acting without the Gaſtrocnemii and Soleus, may extend the Foot almoſt directly, but they can overcome but a very ſmall Reſiſtance. When it acts with the other two Peronæi, the Sole of the Foot is turned more or leſs directly outward toward the external Malleolus.

1035. I cannot help repeating once more, that in order to conceive theſe Uſes as we ought, it is very neceſſary to review the Deſcription of theſe

Muſcles, and what was ſaid concerning the Mechaniſm and Uſes of the Bones of the Tarſus.

*Extenſor Pollicis Longus, Flexor Pollicis Longus, Thenar & Antithenar.*

1036. The Extenſor Pollicis Longus extends the two Phalanges of the Great Toe; and it may likewiſe be an Aſſiſtant to the Tibialis Anticus.

1037. The Flexor Pollicis Longus not only bends the ſecond Phalanx of the Great Toe, but may likewiſe ſerve in great Efforts, as an Aſſiſtant to the Extenſors of the Tarſus. This Muſcle is of great uſe in climbing up a ſteep place.

1038. The Thenar bends the firſt Phalanx of the Great Toe. When the Portion neareſt the inner Edge of the Foot either acts alone, or acts more than the reſt, the Great Toe is ſeparated from the other Toes, eſpecially if it be at the ſame time extended. This Separation may be greater or leſs, according to the degrees of Action of the other Portions of the Thenar.

1039. The Antithenar acting with the Thenar, bends the firſt Phalanx of the Great Toe. When it acts alone, eſpecially if the Great Toe is bent, it brings it nearer the other Toes, in proportion to the degrees of Action of its different Portions.

*Extenſor Digitorum Longus & Brevis.*

1040. The two Extenſores Digitorum Communes concur in extending the four ſmall Toes; and as the Extenſor Longus is not near ſo fleſhy as that of the Hand, this difference is made up by the Extenſor Brevis. The Longus alone ſeems to extend the firſt Phalanges; and they both join in the Extenſion of the ſecond and third Phalanges; the Brevis by the Obliquity of its Direction moderating the Action of the Longus, which otherwiſe would have turned the Toes obliquely the contrary way.

1041. The Extenſor Longus may likewiſe aſſiſt the Tibialis Anticus and Peronæus Anticus in great Efforts, or in keeping the Foot bent; as when we would raiſe a Weight upon the Toes, or overcome any other Reſiſtance. Laſtly, one Extenſor alone would not have been ſufficient to counterbalance the common Flexors.

*Perforatus, Perforans, Flexor Acceſſorius & Lumbricales.*

1042. The Perforatus or Flexor Digitorum Brevis, bends the ſecond Phalanges; and the Perforans or Flexor Longus, the third; the uſe of theſe Muſcles being nearly the ſame with thoſe of the Perforatus and Perforans of the Hand.

1043. The Flexor Acceſſorius, which might very juſtly be termed Plantaris, is an Aſſiſtant to the Perforans, increaſing its Force on ſome occaſions. It likewiſe directs the Tendon of that Muſcle; for by contracting at the ſame time that the fleſhy Belly of the Perforans is in Action, it makes the Tendons go in a ſtreighter Line to the Toes than they would otherwiſe do, becauſe of their Obliquity. It has likewiſe another uſe with relation to the Lumbricales.

1044. The Lumbricales have nearly the ſame functions in the Foot as in the Hand; and they are partly aſſiſted and partly directed by the Flexor Acceſſorius.

*Interoſſei.*

1045. The Interoſſei of the Foot have the ſame uſes as in the Hand. The firſt ſuperior Muſcle brings the ſecond Toe near the Great Toe; the other three bring the ſecond, third and fourth Toes near the Little Toe. The three inferior Muſcles move the laſt three Toes toward the other two. I here ſpeak according to the Situation which I have moſt frequently obſerved; but as that Situation varies, the uſes muſt likewiſe be different.

*Metatarſius. Tranſverſalis. Parathenar Major & Minor.*

1046. The Metatarſius moves the laſt Bone of the Metatarſus, much in the ſame manner as the Metacarpius does that of the Metacarpus. By this Action it draws likewiſe the fourth Bone along with and contracts the Sole of the Foot, increaſing the Convexity of the upper ſide; provided that the Foot is not become inflexible by long wearing ſtrait Shoes, by old Age, or by any other conſtraint or indiſpoſition.

1047. The Tranſverſalis may aſſiſt the Metatarſius in this Action, which is ſuppoſed to be of uſe to Tilers in climbing. The Antithenar may likewiſe concur, and the Peronæus Minimus may ſerve to counterbalance theſe Muſcles, and to bring the Metatarſus back to its natural Situation. The common Extenſors by their neareſt Tendons, may likewiſe be Antagoniſts to the Metatarſius and Tranſverſalis.

1048. The Parathenar Major ſerves particularly to ſeparate the Little Toe from the reſt; and the Parathenar Minor bends the firſt Phalanx of that Toe. Both theſe Muſcles ſeem to be too large and ſtrong, for the neceſſary Motions of ſo ſmall a part on ſo weak a Joint. But as the Little Toe makes a part of the outer Edge of the Sole of the Foot, which is very much expoſed to external Violence when we walk barefooted, and no part of it ſo much expoſed as the Little Toe, very powerful Muſcles were neceſſary to ſtrengthen it on theſe occaſions.

1049. Besides the two Uſes already mentioned, the great and ſmall Parathenar may have another in which they may likewiſe be aſſiſted by the Thenar; and that is to bend the Sole of the Foot according to its breadth, which Action is very requiſite in walking a Tip-Toes, in going up a Ladder, and in Climbing; on which account the two Parathenars deſerve the name of the Tiler's Muſcles, much better than the Tranſverſalis Pedis.

## § 11. *Uſes of the Muſcles imployed in Reſpiration.*

1050. In deſcribing theſe Muſcles I began by the Diaphragm, but in giving their Uſes, all the other Muſcles muſt go before it, for a reaſon which will appear hereafter.

*Scaleni.*

1051. The Scaleni ſeem better fitted for the Motions of the Neck than for thoſe of Reſpiration; and I frankly acknowledge that in reflecting on this, while this Page was in the Preſs, I began to doubt of this latter uſe, eſpecially when I called to mind what I ſaid about the Uſes of the Subclavius N° 822. viz. that I could not believe this Muſcle to be imployed in Reſpiration, becauſe of its Inſertion in the Cartilaginous Portion of the firſt Rib, which is immoveably fixed to the Sternum, and likewiſe much ſhorter, much broader, and conſequently much leſs flexible than the Cartilages of the other Ribs.

1052. Moreover, the Neck in many Situations cannot ſerve as a fixed Point to the Scaleni for the Motion of the Ribs; as for inſtance, when it is bent forward over the Sternum, or inclined very much to either Shoulder; and yet we find that none of theſe Situations do in the leaſt hinder the Motions of Reſpiration.

1053. From this time therefore, I ſhall rank the Scaleni among the Muſcles which move the Vertebræ of the Neck; becauſe the Articulation of the firſt Rib on both Sides, with the firſt Vertebra of the Back, ſeems to ſerve only for the Motion of that Vertebra on the Rib, and not of the Rib on the Vertebra. In this manner ought Truth to be embraced whenever it preſents itſelf.

*Serrati Poſtici.*

1054. The Serratus Poſticus Superior is diſpoſed to move upwards the three or four upper Ribs next the firſt. And if any Portion of this Muſcle ſhould be obſerved to be inſerted in the firſt Rib, that could only ſerve for the Motion of the Vertebræ with which that Rib is articulated, and not for the Motion of the Rib itſelf, becauſe of the Stiffneſs and Immobility of its Cartilaginous Portion.

1055. The Serratus Poſticus Inferior is ſtill better diſpoſed for depreſſing and keeping down the laſt three or four falſe Ribs.

1056. The Uſe which has been aſſigned to theſe two Muſcles, of being Vaginæ or moveable Fræna to the Longiſſimus Dorſi and Sacro-Lumbaris, is without foundation; for the Portions of theſe Muſcles covered by the Serrati, have no more need of ſuch a contrivance, than thoſe which are not covered by them.

*Intercoſtales, & Supra-Coſtales.*

1057. The Poſterior Fibres of the external Intercoſtals, are fixed by their upper Extremities ſo near the Articulation of the Ribs with the Vertebræ, that they cannot depreſs that Rib in which they are ſo inſerted; whereas the Inſertions of their lower Extremities in the following Rib, being at a greater diſtance from the Articulation, they may move that Rib upward. And from thence it follows, that all the remaining part of each external Intercoſtal which terminates at the bony Extremity of each Rib, can only ſerve to raiſe the lower Rib toward the upper.

1058. The Anterior Fibres of the internal Intercoſtals are ſo near the Articulation of the Ribs with the Sternum, that they cannot depreſs that Cartilage in which each of them is inſerted; whereas the inferior Inſertions of theſe Fibres being at a greater diſtance from the Articulation, they are in a condition to raiſe the Cartilages in which they are ſo inſerted. From whence it follows, that all the internal Intercoſtal Muſcles have the ſame Uſe with the external, and that they can have no other.

1059. The Portions which lie between the two Extremities of the Ribs ſerve to increaſe the Force of the ſame uniform Action. And the firſt Rib being immoveable, ſerves for a fixed Point for the Motions of all the other Ribs, and each Rib in particular ſerves for a fixed Point for the Motion of that below it.

1060. The Supra-Coſtales are powerful Aſſiſtants to the Intercoſtals in their common Action, and are therefore very juſtly termed Levatores Coſtarum. But we muſt not confound with theſe, a ſmall Muſcle immediately above the firſt Rib, which by its Inſertion in that Rib, looks like them at firſt ſight.

*Sterno-Coſtales & Sub-Coſtales.*

1061. The Inſertions and Direction of the Sterno-Coſtales being carefully examined, it will be found that their Uſe is to depreſs the Cartilaginous Portions, and Anterior Extremities of the Ribs, eſpecially the ſuperior Ribs, except the firſt; and at the ſame time to draw the Cartilages of the inferior Ribs near the Sternum, by reaſon of the Curvature. They may therefore very well be called Depreſſores Coſtarum, as the Supra-Coſtales are named Levatores.

1062. The Sub-Coſtales having the ſuperior Extremities of their Fibres much more diſtant from the Vertebral Articulations of the Ribs, than the lower Extremities; it follows that they can more eaſily move the upper than the lower Ribs, and conſequently that they are Aſſiſtants to the Sterno-Coſtales.

*Diaphragma.*

1063. The Diaphragm, together with the Intercoſtal Muſcles, the Ribs, Sternum and Vertebræ of the Back, forms the Cavity of the Thorax, and it divides this Cavity from that of the Abdomen.

1064. Its particular Uſe is to be the principal Organ of Reſpiration, that is, of the alternate Expanſion and Contraction of the Thorax. The other Muſcles already mentioned are to be conſidered only as Aſſiſtants and Directors in order to facilitate and regulate theſe Motions, which in the ordinary ſtate are perpetual, but which may by the Action of theſe other Muſcles be accelerated, retarded, or even be ſuſpended for ſome ſpace of time.

1065. The Diaphragm may move when the Ribs are at reſt, and conſequently without the aſſiſtance of the Muſcles which move the Ribs; and this Motion may be ſufficient to keep up the alternate Dilatation and Contraction of the Thorax, without which the Animal cannot live.

1066. In a word, we may continually expire and inſpire by means of the Diaphragm, whether the Ribs move or remain at reſt; and whether the Thorax be kept for a conſiderable time in a ſtate of great Dilatation or of great Contraction; for this does not hinder the Diaphragm from continuing its Motions.

1067. We cannot explain this Mechaniſm, till we have firſt deſcribed ſeveral other Organs on which it depends; and therefore it muſt be referred to the Treatiſe of the Thorax.

### § 12. *Uſes of the Muſcles which move the Head on the Trunk.*

*Sterno-Maſtoidæi.*

1068. The Action of the Sterno-Maſtoidæi is different, according as either both Muſcles or only one of them acts, and according to the different Situation of the Head and Trunk.

1069. When we keep the Head and Trunk ſtreight, whether in ſtanding or ſitting, both Muſcles preſerve the Head in that Poſture againſt any Force by which it would otherwiſe be moved backward. This we may be convinced of by laying the Hand on theſe Muſcles while we endeavour to reſiſt a Force which puſhes back the Head.

1070. One of theſe Muſcles acting alone, may have the ſame Uſe, if the Force to puſh the Head back be applied between the anterior and lateral Parts of it. In that caſe the Sterno-Maſtoidæus on the ſame ſide would oppoſe this Force; but if it were applied directly on the ſide of the Head, that oppoſition would have no effect without the Aſſiſtance of the Splenius on the ſame ſide.

1071. They both ſerve likewiſe to perform the Rotations of the Head, that is, to make it turn to either ſide as on a Pivot; and in this caſe when we turn the Head to one ſide, the Sterno-Maſtoidæus on the other ſide acts, and not that on the ſame ſide; this is an Obſervation of conſequence in Paralytical Diſorders.

1072. They both ſerve in the next place, to bring the Head near the Thorax when we lie on the Back, or bend backward in ſitting. And the lower the Head is in theſe Situations, the more Force muſt theſe Muſcles exert to raiſe it. In this caſe the Sternum being the fixed Point, muſt remain immoveable; but as its Connexion with the firſt Rib, and the Inflexibility of the Cartilage of that Rib, are not always ſufficient for this; the Muſculi Recti of the Abdomen muſt lend their aſſiſtance in great Efforts.

1073. In moſt People, we may feel this Co-operation of the Abdominal Muſcles, in raiſing the Head when they lie on their Back, by laying the Hand on theſe Muſcles. But when the Cartilage of the firſt Rib is very much hardened, and the Articulation quite deprived of Motion, as where the firſt and ſecond Ribs are partly confounded together, of which I have ſeen inſtances; in ſuch People, the Sternum does not want any other aſſiſtance to keep it immoveable, and therefore the Co-operation of the Muſcles of the Abdomen would not be perceiveable.

1074. When being in an erect Poſture, either ſtanding or ſitting, we lower the Head, the Sterno-Maſtoidæi do not act, neither have they any ſhare in that Poſture. It is produced only by the Relaxation of the poſterior Muſcles, by which alone the Head is ſuſtained in this erect Poſture, and without which it would naturally fall forward, as we ſee in thoſe who fall a-ſleep, or are taken ſuddenly ill, while ſitting.

1075. The Inſertions of theſe Muſcles in the poſterior part of the Maſtoide Apophyſes, has made ſome Anatomiſts believe that they are more proper to bend the Head backward than forward; their Inſertions being behind the Condyloide Articulation of the Os Occipitis; and to this they might have added, that the Neck, from the natural diſpoſition of the Vertebræ, is better fitted for Flexion backward than forward.

1076. But in the firſt place, as theſe Inſertions take up a great deal of room, the moveable Point can only be determined to that part which is neareſt the fleſhy Body, and the moſt anterior; and conſequently not ſituated ſo far back as is imagined.

1077. In the ſecond place, as the Motion of the Head forward, by theſe Muſcles, is diſtinct from that of the Neck, the anterior Muſcles of the Vertebræ of the Neck muſt act at the ſame time, and hinder them from bending backward; ſo that in this caſe the Neck may be looked upon as a Pillar, the upper part of which ſupports the Head, while the Head acted upon by the Muſcles, carries the lower part of it forward. It is for want of this Co-operation that Experiments made on dead Bodies have been apt to miſlead.

*Splenius & Complexus.*

1078. The two Splenii ſerve to ſupport the Head in an erect Poſture, whether in ſtanding or ſitting; to moderate the Flexion of the Head forward, and to bring it back again to its natural Poſture.

1079. They ſerve alternately to co-operate with either of the Sterno-Maſtoidæi for the Rotation of the Head: Thus when the right Sterno-Maſtoidæus turns the Head, the left Splenius correſponds with it by its upper part; while the lower part at the ſame time turns the Vertebræ of the Neck.

1080. When we lie on one ſide and raiſe the Head laterally, the Splenius and Sterno-Maſtoidæus of the oppoſite ſide, act in concert. Alſo when we ſtand and incline the Head to one ſide, it is the Splenius and Sterno-Maſtoidæus of the other ſide which moderate that lateral Flexion, and afterwards extend the Head. And as the Sterno-Maſtoidæus is partly inſerted in the Clavicula, the Latiſſimus Dorſi concurs likewiſe in this Action, and fixes the Clavicle by means of its Connexion with the Os Humeri, which is of conſiderable advantage in the Action of the Sterno-Maſtoidæus.

1081. The Complexi are Aſſiſtants to the Splenii, to keep the Head ſtreight in ſitting or ſtanding, to hinder it from inclining forward, and to raiſe it when inclined. When they act together, they as well as the Splenii, may move the Head backward, while the Trunk is bent forward, or when we lie upon the Belly. This latter Motion is commonly named Extenſion, the other, Flexion.

1082. When the Splenius and Complexus of one ſide act together, they may ſupport the Head when obliquely inclined to the oppoſite ſide; bring it back again to its natural Situation, and incline it obliquely toward the ſide on which they lie.

*Recti Poſtici, Obliqui Superiores, &c.*

1083. The Recti Majores and Minores Poſtici, and Obliqui Superiores turn the Head a little backward on the firſt Vertebra of the Neck; and they can neither act otherwiſe nor ſeparately. The Recti Majores contribute moſt to this Motion; and the Minores ſeem likewiſe to hinder the Articular Membranes from being pinched between the Bones in great Motions.

*Recti Antici & Tranſverſales Antici.* 1084. The Recti Majores and Minores Antici, and the two Tranſverſales Antici move the Head forward on the firſt Vertebra; and the Recti Minores and Tranſverſales Breves, likewiſe defend the Capſular Ligaments.

*Obliqui Inferiores.* 1085. The Obliqui Inferiores or Majores are true Rotators of the Head, by turning the firſt Vertebra upon the Odontoide Apophyſis of the ſecond; all which alternate Motions, the Head follows, without being hindered in the Motions forward and backward in any degree of Rotation.

1086. These oblique Muſcles cannot perform any other Motions, being only Aſſiſtants to the Splenii and Sterno-Maſtoidæi. The Obliqui Minores can have no ſhare therein, they being limited to the Inflexion backward, as has been already ſaid. The Obliquity of their Direction which may have deceived ſome Anatomiſts, ſeems only to be contrived to make way for the Inſertions of the Complexi Minores.

1087. Of the Tranſverſales Antici, the firſt only move the Head in the manner above mentioned; neither can they perform any other Motions, their Inſertions being confined to the Os Occipitis and firſt Vertebra. The Tranſverſales Antici Secundi have no ſhare in the particular Motions of the Head, but ought rather to be ranked among the Muſcles which move the Vertebræ of the Neck.

1088. The Complexi Minores belong to the Head only by their ſuperior Portions; the other Portions belonging rather to the Neck. They may ſerve alternately in the lateral Motions of the Head, and thereby co-operate with the Splenius and Sterno-Maſtoidæus of the ſame ſide, when theſe two act together; and they may likewiſe be of uſe to preſerve the Capſular Ligaments to which they adhere.

1089. The ſmall Acceſſorii when they are found, have the ſame uſes with the Muſcles to which they are ſupernumerary.

## § 13. *Uſes of the Muſcles which move the Vertebræ.*

1090. The particular Motions of the Neck ſeem always to be accompanied by thoſe of the Head; but there are ſeveral of theſe Motions in which the Head is only carried along with the firſt Vertebra, as if it adhered immoveably to it. The Neck thus conſidered may be bent forward, ſtreightened, bent backward, inclined to each Shoulder, and turned as on a Pivot, by a Rotation different from that of the firſt Vertebra on the ſecond.

*Scaleni.* 1091. The Scaleni, when they act on each ſide at the ſame time, may aſſiſt in bringing the Neck forward, when we lean back in any reſpect. When thoſe of one ſide act by themſelves, they make a lateral Inflexion either of all the Vertebræ of the Neck together, as in bending the middle of the Neck; or of ſome only, as in bending the lower part of the Neck alone. Theſe lateral Inflexions cannot be made indirectly with the help of the inferior Portion of the Splenius.

1092. The Longi Colli bring the Neck forward by the lower part of their inferior Portions. When one of them acts alone, or acts more than the other, this Motion is more or leſs oblique. The remaining part of theſe Muſcles has no Hand in theſe Motions, which ſeem to be peculiar to the laſt Vertebræ of the Neck on the firſt of the Back. *Longi Colli.*

1093. By the upper and greateſt part of the lower Portion, they counterbalance the poſterior Muſcles of theſe Vertebræ, and hinder the Neck from bending backward by the Contraction of the Sterno-Maſtoidæi, when, lying on the Back, we raiſe the Head.

1094. It muſt here be remembered that the natural Situation of the Bones of the Neck, is oblique on the forepart, and that the Neck is bent in ſuch a manner, as that the convex ſide of the Curvature lies forward, and the concave ſide backward. Therefore when we would hold the Neck ſtreight, and bridle it, as it is called, this Curvature muſt be deſtroyed. This is done by theſe two Muſcles which in this caſe make an Extenſion in a manner, in oppoſite Directions, and fix all the Vertebræ of the Neck cloſe to each other as if they were but one Bone.

1095. The Longus Colli of one ſide performs theſe Motions obliquely, and may likewiſe co-operate in the lateral Inflexions of the Neck with the Scaleni and other Muſcles which perform theſe Motions, as we ſhall ſee afterwards.

1096. The Tranſverſalis Major, Tranſverſalis Gracilis, and the Little Tranſverſales, acting on one ſide, can have no other uſe but to bend the Neck laterally; and to hinder theſe Inflexions when they act on both ſides. The ſmall Tranſverſales may likewiſe preſerve the Capſular Membranes of the Joints from being compreſſed, or otherwiſe hurt by the Motions of the oblique Apophyſes. *Tranſverſales.*

1097. The Semi-Spinales or Tranſverſo-Spinales of both ſides acting together, extend the Neck upon the Trunk, to keep it from inclining forward in ſtanding or ſitting, and bend it backward. The Semi-Spinales of one ſide acting alone, produce the ſame Motions in an oblique Direction, and in that caſe they are aſſiſted by the inferior or vertebral Portion of the neighbouring Splenius under which they croſs. *Semi-Spinales.*

1098. The Semi-Spinales of both ſides may likewiſe ſerve for the Rotation of the Neck, but then the inferior Splenius of the oppoſite ſide muſt aſſiſt them. This Motion is made in the ordinary Situation of the Neck, chiefly on the fourth and fifth Vertebra. They may likewiſe perform the lateral Inflexions of the Neck, by aſſiſting the Longus Colli and Anterior Vertebral Muſcles of the ſame ſide.

1099. The Inter-Spinales are Aſſiſtants to the Semi-Spinales in their mutual Action, and may likewiſe ſerve to bring back the Neck to its natural Situation, after ſmall Motions of Rotation. *Inter-Spinales.*

1100. The Vertebræ of the Back are moved by being bent forward, by being extended or ſtreightened, and by being inflected directly or obliquely toward each ſide. The Motion of Rotation has no place here, be-

cauſe

cauſe of the particular Structure of the Joints of theſe Vertebræ and their Connexion with the Ribs, which likewiſe hinder the Flexion backward. Flexion and Extenſion are the two principal Motions and much more apparent than the others.

1101. The Flexion of the Back forward is not performed by any particular Muſcles, but depends both in ſtanding and ſitting, on the Relaxation of the Muſcles that extend or ſtreighten it, and keep it in that erect Poſture. In that caſe the Weight of the Head obliges the Vertebræ to bend forward more or leſs in proportion to the degree of Relaxation of the Extenſor Muſcles.

1102. To facilitate this Flexion, we commonly raiſe the Shoulders; which being done by the Action of the Serratus Major, the Rhomboides muſt be relaxed at the ſame time, by which the upper part of the Back is left at liberty. The lower part is moſt eaſily bent, becauſe the falſe Ribs not being fixed by their anterior Extremities, advance forward ſliding a little upon each other.

1103. When we lie upon the Back or Side, this Flexion is performed chiefly by the Abdominal Muſcles; ſo that the greateſt part of the Uſes of all the Muſcles belonging to the Vertebræ of the Back, is confined to Extenſion alone.

*Sacro-Lumbares.*

1104. The two Sacro-Lumbares maintain the Back and the Regio Lumbaris in their natural Situation when we ſtand or ſit; and by the Relaxation of their Fibres more or leſs, the Trunk is proportionably bent forward by the Weight of the Head and Breaſt. They likewiſe extend the Back and Loins in all Poſtures, keep them ſteddy and fixed under the Weight of Burdens, and bend the Loins backward.

1105. One of them acting alone, may have the ſame Uſes of bending forward, extending, reſiſting and bending backward, but with leſs Strength, and in an oblique Direction, as when the Body is inclined obliquely forward, and to one ſide at the ſame time, or extended from that Poſture. They likewiſe ſerve to counterbalance the oblique Muſcles of the Abdomen, in turning the Thorax upon the Pelvis, as mentioned Nº 130.

1106. These Muſcles may in ſome reſpects be compared with the Splenii; i. e. their Superior Inſertions with the Maſtoide Inſertions of the Splenii; and their Inferior Inſertions with the Vertebral Inſertions of theſe Muſcles. The Maſtoide Portion of the Splenius is longer, more diſtant from the Articulation, and more diſpoſed to perform large Motions and to reſiſt great Efforts than the Vertebral Portion. In like manner the Coſtal Portion of the Sacro-Lumbaris, by the length of the Tendinous Series, by their graduated Inſertions in the Ribs, and by their Obliquity, is better diſpoſed for the Uſes already mentioned, than the Vertebral Portion.

1107. The ſmall Muſcular Faſciculi which croſs theſe Tendinous Portions, called Muſculus Sacro-Lumbaris Acceſſorius, ſeem to counterbalance and moderate the Depreſſion of the Ribs in the great Efforts of the Sacro-Lumbaris.

1108. The uſe of theſe Muſcles in progreſſive Motion, is not ſufficiently demonſtrated. It is ſuppoſed that while we lift one Leg to make a Step, the Sacro-Lumbaris of the other ſide ſuſtains the Vertebræ of the Loins and Back, to prevent their yielding to the Pſoas which lifts the Leg, and puts it in Motion; but the Direction of the greateſt part of the Fibres of the Sacro-Lumbaris is very improper for ſuch an Uſe.

1109. The uſe of the Sacro-Lumbaris in Reſpiration is likewiſe attended with difficulties; for when the Body is very much inclined forward, and even much loaded, the Ribs continue ſtill to be raiſed with the ſame eaſe as they are depreſſed, though the Sacro-Lumbaris is chiefly imployed in this caſe; but it is to be remembered that I ſpeak here only of bending and loading the Back, not of loading the Shoulders. In the firſt caſe the Ribs move eaſily, but not in the ſecond.

*Longiſſimus Dorſi.*

1110. The Longiſſimus Dorſi is an Aſſiſtant to the Sacro-Lumbaris, eſpecially to the Vertebral Portion of that Muſcle, which it helps very powerfully both by the Multiplicity and Inſertions of its Fibres, in ſuſtaining the Vertebræ of the Back and Loins while extended, whether in ſitting or ſtanding, and in preventing their ſinking under the Weight of the Body, or of any additional Burden. It aſſiſts in performing and in counterbalancing all the Motions and Inflexions of which theſe Vertebræ, eſpecially thoſe of the Loins, are capable in all Poſtures of the Body; and in this it bears likewiſe ſome reſemblance to the inferior or vertebral Portions of the Splenius; and it muſt here be remembered that theſe two Muſcles on each ſide, and the Sacro-Lumbares, are of the number of thoſe called Vertebrales Obliqui Divergentes.

*Spinales & Tranſverſales Dorſi & Lumborum.*

1111. All the Spinales and Tranſverſales of the Back and Loins belonging to the Claſs of the Vertebrales Recti; the Spinales, to the middle Muſcles, and the Tranſverſales, to the lateral, according to the Idea given of them when I ſpoke of the Vertebral Muſcles in general, their chief Uſes muſt be to aſſiſt, moderate, and maintain the Motions of Extenſion and lateral Inflexion, whether ſimple and direct, or oblique and compound; much in the ſame manner as is done by the like Muſcles of the Neck.

1112. The Spinales Majores and Tranſverſales Majores have this peculiar to them, that their fleſhy Portions not lying in a ſtreight Line between their Inſertions, they may perform not only direct Motions when they act in even numbers, but alſo oblique Motions, when the numbers on each ſide are unequal. The ſmall Spinales and Tranſverſales being confined between two neighbouring Vertebræ, cannot co-operate but in direct Extenſions and Inflexions.

*Semi-Spinales Dorſi & Lumborum.*

1113. The Semi-Spinales or Tranſverſo-Spinales being oblique, converging, vertebral Muſcles, are Aſſiſtants to the Sacro-Lumbaris and Longiſſimus Dorſi, which they croſs on each ſide. By this Decuſſation joined to the Multiplicity, and graduated Diſtribution of their Inſertions, they increaſe the Strength of the other Muſcles conſiderably, whether they act equally and uniformly with them, or alternately. The Lumbar Semi-Spinales, called by the Ancients, Muſculus Sacer, becauſe of their Inſertions in the Os Sacrum, are more expoſed to Motions and Strains than thoſe of the Back, and are likewiſe larger and thicker. They are much better fitted than the Sacro-Lumbares for ſupporting the Pelvis on both ſides in walking, and on one ſide, when we raiſe the Foot on that ſide, and ſupport ourſelves on the other.

*Quadratus Lumborum & Pſoas Parvus.*

1114. THE Quadratus Lumborum and Pſoas Parvus are of the ſame uſe to the Vertebræ of the Loins as the Scaleni to thoſe of the Neck. When both Quadrati act, they keep the Lumbar Pillar ſtreight, that is ſo as not to incline to either ſide, and then they may aſſiſt the Recti of the Abdomen in the Inflexions forward, and the ſuperior Portions of the Obliqui in lateral Inflexions.

1115. THEY may likewiſe ſerve to ſupport the Hanches alternately in walking; and in ſtanding on one Foot the Quadratus of the oppoſite ſide may ſupport the Hanch of that ſide; in which Action they co-operate with the Tranſverſo-Spinales and poſterior Parts of the Obliqui Abdominis.

1116. The Pſoas Parvus when it is found, ſerves to ſuſtain the Pelvis much in the ſame manner with the Muſculi Recti of the Abdomen, in climbing, &c. But when we ſtand, we have no need of ſuch a Support, the Pelvis reſting then upon the Oſſa Femoris, in ſuch a manner as that the largeſt Portion thereof, and that which ſupports the whole Body, lies behind that Fulcrum, and the ſmalleſt Part, before. It may likewiſe ſerve to hinder the Vertebral Pillar from bending backward on ſome occaſions.

*Coccygæus Anterior.*

1117. THE Coccygæus Anterior may ſuſtain the Coccyx in Æquilibrio, and hinder it from being bent backward, and from being luxated in great Strains, as in the Excretion of hardened Fæces, &c.

*Coccygæus Poſterior.*

1118. THE Coccygæus Poſterior can only ſerve to replace the Os Coccygis when it has been forced backward, and to hinder it from being luxated backward.

## § 14. *Uſes of the Muſcles which move the Lower Jaw.*

*Temporalis.*

1119. THE two Temporales acting together, raiſe the Lower Jaw, preſs the Teeth in that Jaw againſt the upper Teeth, and pull it back when it has been carried ſo far forward, as that the lower Inciſores get before the upper. They perform the laſt motion by their moſt poſterior Portion which paſſes over the Root of the Zygomatic Apophyſis, and the other Motions by the Co-operation of all their Muſcular Radii.

*Maſſeter.*

1120. THE two Maſſeteres ſerve to raiſe the Lower Jaw, and to puſh the lower Teeth againſt the upper, in which uſe they co-operate with the Temporales. They likewiſe bring this Jaw forward by their external and largeſt Portion; draw it back by their middle Portion; and move it laterally by their ſuperior Portions acting alternately. By the Co-operation

tion of all the three Portions, they preſs the lower Teeth againſt the upper.

1121. Both Pterygoidæi Interni ſerve to raiſe the Lower Jaw, to bring the lower Teeth near the upper, and to move the Jaw laterally, as in grinding the Food. They cannot bring the Jaw a great way forward, in order to ſet the lower Inciſores before the upper, and they can be of no uſe in bringing it back. *Pterygoidæus Internus.*

1122. The two Pterygoidæi Externi bring the Lower Jaw forward, in order to ſet the lower Inciſores before the upper, in which Action they are Antagoniſts to the poſterior Portion of the Temporales and the great Portion of the Maſſeteres. When one of them acts, it carries the Chin obliquely forward, or turns it towards the other ſide. This oblique Motion is performed alternately by theſe two Muſcles acting ſingly. *Pterygoidæus Externus.*

1123. The two Digaſtrici ſerve to depreſs the Lower Jaw and to open the Mouth; in doing which, the Mechaniſm of theſe Muſcles has appeared to all Anatomiſts to be very ſingular, on account of their middle Tendons, their Inſertions, Adheſions, and their manner of paſſing by another Muſcle. The Incurvation of this middle Tendon has not only been looked upon as neceſſary to change the Direction of the Muſcles, but it has been believed that without this change of Direction, they could not have depreſſed the Jaw any further than the Weight of the Jaw would contribute to that Action. *Digaſtricus.*

1124. This Incurvation and Paſſage has been compared to that of a Rope over a Pulley, without which advantage it was thought that theſe Muſcles could not reſiſt the continual Efforts of their powerful Antagoniſts, nor overcome any exterior Oppoſition, ſuch as that of the Hand preſſing upon the Chin. But when we examine carefully the Structure of the Jaw and the Inſertions of theſe Muſcles, it appears evidently that their Connexion with the Os Hyoides is not neceſſary for the Uſe aſſigned to them of depreſſing the Jaw; as may be proved both on a Skeleton and on a freſh Subject.

1125. In a Skeleton in which the Motion of the lower Jaw is preſerved by Art, we need only tie a piece of Packthread to the lower part of the Chin where the Digaſtricus is inſerted, and then keeping the Lower Jaw cloſe to the upper by any proper contrivance, paſs the other end of the String through the Maſtoide Groove, and we will perceive by pulling the String in a ſtreight Direction between theſe two places, that the Jaw will be depreſſed.

1126. This Experiment may be made without the help of a Spring, or any other Contrivance to keep the Jaw ſhut, by ſimply inverting a proper Skull, ſo that the Lower Jaw may by its own Weight fall on the upper; for by drawing the String as before, the Lower Jaw will be raiſed, that is, parted from the other, and by letting the String go, it will fall back again to its firſt Situation.

1127. On a freſh Subject the Experiment may be made in the following manner. The Connexion of the Digaſtricus with the Os Hyoides and Muſculus Stylo-Hyoidæus being intirely deſtroyed; let it be pulled by its poſterior Extremity directly toward the Maſtoide Groove, in the ſame manner as the String was drawn, in the foregoing Experiments.

1128. Anatomists have not conſidered that the two Rami of the Lower Jaw are crooked or angular Levers, and that each Digaſtricus paſſing by the Angle in that Bone, ought to be looked upon as being inſerted therein, ſo that the Action of the Lever is to be confined to that Portion which lies between the Angle and the Condyle without taking in what lies between the Angle and the Chin.

1129. It may be aſked therefore why the anterior Inſertion of the Digaſtricus reaches ſo far as the Chin, ſince it might have been in the Angle of the Bone; and what is the uſe of its Connexion with the Os Hyoides, of its Incurvation and Change of Direction. The firſt queſtion is anſwered by calling to mind what has been ſaid about the extent or largeneſs of Motion, about the neceſſity of long Fibres for large degrees of Motion, and about lateral Motions. Had this Muſcle been inſerted in the Angle, its Fibres would not have been proportioned to the degrees of Motion required, and for the ſame reaſon the lateral Motions would have been obſtructed.

1130. In anſwer to the ſecond queſtion about the Connexion of this Muſcle with the Os Hyoides and its Incurvation, it is to be remembered that the Digaſtricus has another uſe beſides that of depreſſing the Lower Jaw; which is to aſſiſt in Deglutition, of which it is one of the principal Organs. I demonſtrated this uſe of the Digaſtricus above eight Years ago in my publick Courſes in the Phyſick Schools, and at the Royal Garden; but as the whole Mechaniſm of Deglutition cannot be explained till the Tongue, Larynx and Pharynx have been deſcribed, I ſhall only add in this Place the following Remarks, to prove the uſe of the Digaſtrici in that Action.

1131. We cannot ſwallow without raiſing the Larynx or Pomum Adami, as it is commonly called, at the ſame time, as every one may ſatisfy himſelf by laying his Hand on that part of the Throat in the time of Deglutition. We are likewiſe obliged to keep the Lower Jaw raiſed while we ſwallow, and when it is depreſſed we find that Action impoſſible. Laſtly, the Larynx cannot be raiſed but by means of its Connexion with the Os Hyoides; and the Muſcles of that Bone are too weak to reſiſt the Efforts of the Baſis of the Tongue, and of the ſolid Food which we ſwallow.

1132. Therefore while the Temporal and Maſſeter Muſcles keep the Lower Jaw cloſely applied to the upper, in Deglutition, the Digaſtrici contract at the ſame time, as may be felt by putting the end of the Finger upon the place where they are inſerted in the Edge of the Chin. And as the Lower Jaw remains immoveable, the Digaſtrici are ſtreightened by their Contraction, and by the Connexion of their middle Tendons with the Os Hyoides, they raiſe that Bone and the Larynx together with it.

1134. The Force of theſe Muſcles is very conſiderable, as may be ſhewn by laying the Elbow on a Table, and leaning with the Chin on the Hand, while we endeavour at the ſame time to depreſs the Lower Jaw; for as in that caſe this Jaw cannot deſcend, the Digaſtrici by their Inſertions in the Apophyſis Maſtoidæa, raiſe the upper Jaw by bending the Head backward on the Condyles of the Lower Jaw. A piece of Wood ſupporting the Chin in place of the Arm, will render this Experiment more ſenſible and more certain. The involuntary Motion termed Yawning, is likewiſe a proof of the Strength of theſe Muſcles.

1135. In the Action of the Digaſtrici in Deglutition, we meet with one very ſingular Phænomenon, of which there is hardly another example to be found among all the Muſcles of the Human Body. For in all other inſtances, wherever Antagoniſt Muſcles act at the ſame time, they all co-operate in producing what is called a Tonic Motion; but in this caſe the Levators and Depreſſors of the Lower Jaw act together for different uſes; that is, the Temporal and Pterygoide Muſcles are in Action to raiſe the Jaw and to keep it in that Situation, while the Digaſtrici their Antagoniſts perform an Office which has no relation to that Bone.

*Contrivances of the Inter-articular Cartilages.*

1136. Two Eminences in one Bone articulated with two Cavities in another, allow only of two contrary Motions as in a Ginglymus, and in the Articulation of the Os Occipitis with the firſt Vertebra. But the Lower Jaw, though articulated by its two Condyles with the Glenoide Cavities of the Oſſa Temporum, has four direct Motions, one forward, one backward, one downward and one upward; and two lateral Motions, one to the right the other to the left. And laſtly, in all degrees of the direct Motions, it may at the ſame time have any degree of lateral Motions.

1137. This Contrivance depends on the Inter-articular Cartilages deſcribed among the freſh Bones Nº 348. 349. In the lower ſide of each of theſe Cartilages, there is but one Cavity ſuited to the Convexity of the Condyle which it receives; and it is not turned directly downward, but obliquely backward; as the Condyle is not turned directly upward, but obliquely forward. The upper ſide is hollow on the forepart, and convex on the backpart, anſwering to the articular Eminence and Foſſula of the Os Temporis.

1138. In the natural Situation of the Lower Jaw, and while it remains in Inaction, it is ſo diſpoſed as that the anterior Convexity of the Condyles anſwers obliquely to the poſterior articular Eminences of the Oſſa Temporum, and with this Diſpoſition that of the Inter-articular Cartilages agrees.

1139. In the direct Motions upward, the Cartilages ſlide backward and upward toward the Meatus Auditorius, the Condyles ſtill continuing in the Cavity of their lower ſides; as is moſt evidently perceived when we preſs the Teeth hard againſt each other; and the ſame thing happens in the direct Motions forward. In the direct Motions downward, the Cartilages ſlide downward and forward; the Condyles ſtill remaining in their inferior Cavities, and the ſame happens in the direct Motions backward.

1140. In the lateral Motions, the Condyles are carried alternately to the right and left ſides, and the Cartilages follow their Motions, ſo that the Condyle on that ſide toward which the Jaw is turned, juts outward, and that on the oppoſite ſide ſinks inward; the prominent Condyle having at the ſame time a ſmall Motion backward, and the other Condyle, forward.

1141. From theſe Obſervations we learn that the Ginglymoide Motions of the Lower Jaw, depend particularly on the inferior Cavities of the Inter-articular Cartilages, and that the Motions forward, backward, and to either Hand, depend on the upper ſide of theſe Cartilages. The Pterygoidæi Externi move the Lower Jaw forward; the poſterior Portions of the Temporales move it backward; the left Pterygoidæus Internus turns it to the right Hand; and the right Pterygoidæus Internus, to the left Hand. The Pterygoidæus Externus of one ſide and the poſterior Portion of the Temporalis of the other ſide, may at the ſame time perform the ſmall Motions mentioned at the end of the laſt N°.

### § 15. *Uſes of the Muſcles which move the Os Hyoides.*

1142. The Mechaniſm obſerved in the Motions of the Os Hyoides, as well as in thoſe of the Scapula, is very particular and very different from what we find in all the other Bones of the human Body. All theſe Bones have ſolid Fulcra, on which they are either moved or kept fixed by the proper Muſcles, after the manner of a Lever or otherwiſe; whereas the Os Hyoides is meerly ſuſpended, having nothing to fix it, but theſe very Muſcles which move it in different manners.

*Mylo-Hyoidæus.* 1143. The Mylo-Hyoidæus repreſents a moveable Floor or Bed which ſuſtains the Tongue with its Muſcles and Glands, and forms the bottom of the Cavity of the Mouth. When the two Portions of this Muſcle act together, they draw the Os Hyoides a little forward, and fix it in that Situation, raiſing the whole Tongue at the ſame time, and compreſſing the Glandulæ Sub-Linguales. If one lateral Portion acts more than the other, it puts the Os Hyoides in an oblique Situation; and in a condition to ſerve as a fixed Point for the Motions of the Tongue.

*Genio-Hyoidæi.* 1144. The Genio-Hyoidæi pull the Os Hyoides much more forward than the Mylo-Hyoidæus; and as they are very narrow, and cloſely united together, there ſeems to be very little occaſion for one of them to act without the other.

*Stylo-Hyoidæi.* 1145. The Stylo-Hyoidæi move the Os Hyoides upward and backward in a middle Direction, between thoſe in which they lie; and they draw it more upward and backward when they act freely, that is, without being checked or confined by other Muſcles, in the manner which we ſhall ſee hereafter. When one acts more than the other, the Bone is moved obliquely.

*Omo-Hyoidæi.* 1146. The Omo-Hyoidæi or Coraco-Hyoidæi act as the Stylo-Hyoidæi in a middle Direction between the oblique Directions in which they lie, and draw the Os Hyoides downward and backward, when they are not counterbalanced by the Stylo-Hyoidæi. When one acts more than the other, the Bone is drawn obliquely to the right or left Hand.

1147. When theſe Muſcles and the Stylo-Hyoidæi act together, the Os Hyoides is drawn backward by a direct Motion compounded of four oblique Motions. This compound Motion is directed more upward or more laterally according to the degree of Action of the Stylo-Hyoidæi or Omo-Hyoidæi, or of any one Muſcle of each Pair; and in all theſe Motions, the four Muſcles are counterbalanced by the Genio-Hyoidæi.

1148. The length and direction of theſe two thin Muſcles, as well as their Inſertion in the Scapula, deſerve our attention. To me it ſeems evident, that for the Uſes already mentioned, they could not have been inſerted any where elſe; and therefore that they are fixed in the Scapula by a mechanical Neceſſity, and muſt conſequently be very long. Their incurvated Direction and Situation behind the Sterno-Maſtoidæi, enables them to perform their ſeveral Motions in all the different Poſtures of the Head; the lateral Motions not excepted; for when we turn the Head to either ſide, the Sterno-Maſtoidæus of the ſame ſide does the Office of a Pulley to the Omo-Hyoidæus behind it.

*Sterno-Hyoidæi.* 1149. The Sterno-Hyoidæi draw the Os Hyoides directly downward, and ſerve to counterbalance the different Motions of the Stylo-Hyoidæi, Omo-Hyoidæi and Genio-Hyoidæi. They may in ſome caſes be aſſiſted by the Sterno-Thyroidæi and Thyro-Hyoidæi, as we ſhall ſee hereafter.

## § 16. *Obſervations on the Co-operation of Muſcles.*

1150. I took notice N° 43. that in order to move any part, or to keep it in a determinate Situation, all the Muſcles belonging to that part muſt co-operate, and with reſpect to this Co-operation, I diſtinguiſhed the Muſcles into principal Movers, Moderators, or Antagoniſts, and Directors or collateral Movers.

1151. In N° 44. I obſerved that all theſe kinds are to be found in the Articulations by Enarthroſis, and in many of thoſe by Arthrodia; but that in thoſe by Ginglymus, the Director Muſcles are wanting. Laſtly, that in ſome caſes the Moderators do not act; the want of their Action being then ſupplied by the Weight of the Part to which they are fixed, or by the additional Weight or Reſiſtance of ſome other Body.

1152. The Remarks which were made on the Motions of Supination and Pronation N° 894. furniſh us with a very ſingular example of the Co-operation of Muſcles; and it is likewiſe evidently ſeen in the Motions of the Scapula on the Trunk, and of the Os Hyoides. But it is chiefly in Standing, Sitting, Progreſſion, and in the Motions of the Arm, that we obſerve the Co-operation of a great number of Muſcles proportionable to the Situation of the Parts.

1153. When we ſtand in the moſt common and natural way, the Soles of the Feet are placed horizontally as the common Baſes of the whole Body. To ſupport the Legs like immoveable Pillars upon this Baſis, the Muſcles which either cover or are fixed in them, muſt co-operate. The principal Movers are the Gaſtrocnemii and Soleus; the Moderators are the Tibialis Anticus, and Peronæus Medius, and Minimus; and the Directors are the Tibialis Poſticus, and Peronæus Maximus.

1154. The Legs ſupported in a Vertical Situation by the Co-operation of all theſe Muſcles, as by ſo many Ropes more or leſs ſtretched, ſupport the Oſſa Femoris which are fixed in the proper Situation by the Action of the two Vaſti and Crureus; the Rectus Anterior being of no uſe to the Os Femoris in this Situation. The Vaſti and Crureus are here the principal Movers, and they act without Moderators or Directors; for as theſe Bones are bent backward, the Weight of the Body ſupplies the place of very ſtrong Antagoniſts.

1155. The Thighs in this Situation ſupport the Pelvis; in order to fix which, the principal Movers, Moderators and Directors are all imployed. But theſe different Offices change in proportion as we ſtand more or leſs erect. When we ſtand very ſtreight, the Co-operation of all the Muſcles which can move the Pelvis on the Oſſa Femoris, may be looked upon as uniform, or as a kind of Tonic Motion, eſpecially the Co-operation of the Glutæi, Tricipites, Recti Anteriores, Sartorii, Semi-Nervoſi, Semi-Membranoſi, and of the Bicipites chiefly when the Head is a little inclined forward.

1156. The Spina Dorſi and Thorax are ſupported in ſtanding by the Co-operation of the Vertebral Muſcles and Longiſſimi Dorſi which are here the principal Movers; of the Sacro-Lumbares, which are partly principal Movers and partly Directors; and of the Quadrati Lumborum, which are wholly Directors. In this Situation of the Spine, the Weight of the Thorax and of the Head, which naturally inclines forward, counterbalances the Vertebrales, Longiſſimi Dorſi, and Sacro-Lumbares, and therefore acts in place of Moderators.

1157. The Head and Neck are ſupported in an erect Poſture, by the proportionate Co-operation of all the Muſcles which move the Head by it ſelf, or together with the Neck. The Obliqui Majores are the only Muſcles which can be ſuppoſed to remain in Inaction, while the Head is kept ſtreight without moving either that or the Neck.

1158. The Splenii and Complexi are here the principal Movers, together with the Spinales and Semi-Spinales Colli. The Anterior Vertebral Muſcles of the Neck are rather Aſſiſtants than Moderators in reſpect of the Head, but with regard to the Neck they are compleat Antagoniſts, without the aſſiſtance of which, the Neck would bend forwards and the Head fall backward, as has been already obſerved.

1159. In this Poſture the Sterno-Maſtoidæi act neither as Flexors nor as Moderators of the uniform Action of the Splenii, Complexi, and Poſterior Vertebrales; the Action of theſe Muſcles being counterbalanced by the Weight of the Head. Yet the Sterno-Maſtoidæus of one ſide, together with the Splenius next to it; and the other Sterno-Maſtoidæus and Splenius likewiſe taken together, are reciprocally principal Movers and lateral Moderators, aſſiſted by the Tranſverſales and Sealeni.

1160. From what has been ſaid about ſtanding, we ſee not only an eminent inſtance of the Co-operation of Muſcles, but the variety of their Uſes, and the impropriety of their common Denominations. The Gaſtrocnemii, Soleus, and Tibialis Poſticus are in this caſe Extenſors of the Leg and not of the Foot. The Vaſti and Crureus extend the Thigh and not the Leg. The Recti Anteriores do not extend the Leg, nor the Sartorii bend it, but are all imployed in fixing the Pelvis on the Oſſa Femoris.

1161. Progression or the Motion of walking, demonſtrates ſtill more palpably, the Co-operation of Muſcles, and at the ſame time the variety of their Functions. In that caſe the whole Body is alternately ſupported on one lower Extremity, while the other hangs in the Air. This makes a kind of imperfect ſtanding, in which the Co-operation of the Muſcles is much the ſame as in ordinary ſtanding with reſpect to the Foot, Leg and Thigh; but with reſpect to the Pelvis, there is a conſiderable difference.

1162. To ſtand ſtreight on the two Extremities, the Pelvis is only to be kept from falling backward, and ſometimes from falling forward. But when we ſtand upon one Extremity, the Pelvis muſt not only be fixed upon the Thigh, to hinder it from falling toward the ſide of the other raiſed Extremity; but the Spine muſt likewiſe be kept from inclining toward that ſide.

1163. The Pelvis is ſupported in this caſe by a very ſtrong Co-operation of the Glutæus Medius & Minimus, as principal Movers; and by the Glutæus Maximus and Muſculus Faſciæ Latæ, as Aſſiſtants; and at the ſame time the Spine is ſupported by the Sacro-Lumbaris, Latiſſimus Dorſi and Quadratus Lumborum of the ſame ſide.

1164. In ſitting, the Pelvis reſts on the two Tuberoſities of the Os Iſchium, and ſo cannot fall to either ſide; but it muſt be hindered from falling either backward or forward; which is done by the Co-operation of the Recti Anteriores, Sartorii, Semi-Membranoſi, Semi-Tendinoſi, and the long Portions of the Bicipites; and to theſe might be added the Iliaci, and the Pſoai, both ordinary and extraordinary.

1165. These Obſervations are ſufficient to ſhew the uſefulneſs and neceſſity of being well acquainted with the Co-operation of Muſcles; becauſe without this knowledge, it is impoſſible to explain the particular Motions of ſome Bones, or to diſcover or remove the Diſorders or Impediments to which theſe Motions may be liable.

1166. I shall only mention one caſe to ſhew the importance of ſuch Obſervations. A Perſon complains of a Pain at the lower part of the Scapula,

pula, and that this Pain is very acute in every Motion of Supination or Pronation, though he keep the Fore-Arm bent, which is the moſt natural, moſt commodious, and moſt favourable Poſture in this caſe, and holds it cloſe to his ſide, by means of a Scarf, or otherwiſe.

1167. If we are not acquainted with the Co-operation of the Rotator Muſcles of the Os Humeri, in the ordinary Motions of Supination and Pronation, which I explained in giving the Uſes of the Muſcles which move the Radius, we can never be able to explain or remove this diſorder.

1168. The common recourſe, when we are without this neceſſary knowledge, would be to indeterminate Ideas of ſome communication between the Nerves and Veſſels of the Fore-Arm and thoſe of the Shoulder; and the Diſorder would be imputed to ſome Obſtruction in the Veſſels, or Irritation or Strain of the Nerves, &c. On this Foundation, we would order the Application of Remedies to the Parts anſwering to theſe Veſſels and Nerves; and when a great length of time had been imployed in the Cure, the true unknown cauſe would either diminiſh or quite diſappear of itſelf, or perhaps increaſe, and thereby occaſion other Diſorders of worſe conſequence and ſometimes mortal.

1169. But a Perſon well acquainted with the Muſcular Co-operations, and who knows preciſely how to diſtinguiſh the Muſcles proper for each Co-operation, can never commit ſuch Miſtakes.

## The End of the Firſt VOLUME.

# AN ANATOMICAL EXPOSITION OF THE STRUCTURE OF THE HUMAN BODY.

BY

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Tranſlated from the French Original,

By G. DOUGLAS, M.D.

Illuſtrated with COPPER PLATES,

VOL. II.

The THIRD EDITION, Correcteđ.

TO

# Dr. BROXOLME.

SIR,

AN *Engliſh* Phyſician, eminent in all the Branches of his Profeſſion, is undoubtedly the moſt proper Perſon to recommend a laudable Attempt made by an obſcure Beginner, toward the Improvement of Phyſick in the *Engliſh* Dominions. I ſhall make no farther Apology for prefixing Your Name to this Phyſical Part of an *Engliſh* Edition of the beſt Syſtem of Anatomy that has hitherto appeared. I have the Honour to be, with the greateſt Reſpect,

SIR,

*Your Moſt Obedient,*

*Moſt Obliged Servant,*

Bow-Lane,
Nov. 1, 1732.

G. DOUGLAS.

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AN

# Anatomical Expoſition

OF THE

# STRUCTURE

OF THE

# HUMAN BODY.

## SECT. IV.

### *A Deſcription of the Arteries.*

*Introduction.*

1. THE Heart throws the Blood into two great Arteries; one of which is named Aorta, the other, Arteria Pulmonalis.

2. THE Aorta diſtributes the Blood to all the parts of the Body, for the nouriſhment of the parts, and for the Secretion of different Fluids.

3. THE Arteria Pulmonalis carries the venal Blood through all the capillary Veſſels of the Lungs.

4. BOTH theſe great or general Arteries are ſubdivided into ſeveral Branches, and into a great Number of Ramifications. In this Section, I ſhall deſcribe the Diſtributions of the Aorta, leaving the pulmonary Artery to the particular Hiſtory of the Lungs.

*The Aorta in general.*

5. THE Baſis of the Heart being very much inclined to the right Side, and turned a little backward, the Aorta goes out from it in a direct courſe, nearly over-againſt the fourth Vertebra of the Back. Its courſe, I ſay, is direct with reſpect to the Heart, but with reſpect to all the reſt of the

Body, it aſcends obliquely from the left to the right Hand and from before, backward.

6. Soon after this, it bends obliquely from the right hand to the left, and from before, backward, reaching as high as the ſecond Vertebra of the Back; from whence it runs down again in the ſame Direction, forming an oblique Arch. The middle of this Arch is almoſt oppoſite to the right ſide or edge of the ſuperiour Portion of the Sternum, between the cartilaginous Extremities or ſternal Articulations of the firſt two Ribs.

7. From thence the Aorta deſcends in a direct courſe along the anteriour part of the Vertebræ, all the way to the Os Sacrum, lying a little toward the left hand; and there it terminates in two ſubordinate or collateral Trunks, call'd Arteriæ Iliacæ.

*General Diviſion of the Aorta.*

8. The Aorta is by Anatomiſts, generally divided into the Aorta Aſcendens and Aorta Deſcendens, tho' both are but one and the ſame Trunk. It is termed Aſcendens, from where it leaves the Heart to the Extremity of the great Curvature or Arch. The remaining part of this Trunk from the Arch to the Os Sacrum or Bifurcation already mentioned, is named Deſcendens.

9. The Aorta Deſcendens is further divided into the ſuperiour and inferiour Portions; the firſt taking in all that lies above the Diaphragm; the other, all that lies between the Diaphragm and the Bifurcation.

10. The Aorta Aſcendens is chiefly diſtributed to part of the Thorax, to the Head and upper Extremities. The ſuperiour Portion of the Aorta Deſcendens furniſhes the reſt of the Thorax; the inferiour Portion furniſhes the Abdomen and lower Extremities.

11. The great Trunk of the Aorta through its whole length, ſends off immediately ſeveral Branches which are afterwards differently ramified; and theſe arterial Branches may be looked upon as ſo many Trunks with reſpect to the other Ramifications; which again may be conſidered as ſmall Trunks, with regard to the Ramifications that they ſend off.

12. The Branches which go out immediately from the Trunk of the Aorta, may be termed original or capital Branches; and of theſe ſome are large and others very ſmall.

13. The large capital Branches of the Aorta are theſe: two Arteriæ Subclaviæ: two Carotides, one Cæliaca, one Meſenterica Superior, two Renales, formerly termed Emulgentes, one Meſenterica Inferior, and two Iliacæ.

14. The ſmall capital Branches are chiefly the Arteriæ Coronariæ Cordis, Bronchiales, Œſophagææ, Intercoſtales, Diaphragmaticæ Inferiores, Spermaticæ, Lumbares, and Sacræ.

15. These capital Branches or Arteries are for the moſt part diſpoſed in Pairs; there being none in odd Numbers but the Cæliaca, the two Meſentericæ, ſome of the OEſophagææ, the Bronchialis, and ſometimes the Sacræ.

16. The Ramifications of each capital Branch are in uneven numbers with reſpect to their particular Trunks; but with reſpect to the Ramifications of the like capital Trunks on the other ſide, they are diſpoſed in Pairs. Among the Branches there are in odd numbers, none but the Arteria Sacra when it is ſingle, and the OEſophagææ, the Ramifications of which are ſometimes found in Pairs.

17. Before I enter upon the detail of each of theſe particular Arteries, many of which have proper Names; it will be convenient to give a ſhort View of the Diſpoſition and Diſtribution of the principal arterial Branches, as a general Plan to which all the particularities of each diſtribution may afterwards be referred: for I have found by Experience, that the common Method of deſcribing the Courſe of all the Ramifications of theſe Veſſels, without having firſt given a general Idea of the principal Branches, is very troubleſome to Beginners.

*General Diſtribution of the Branches of the Aorta.*

18. The Aorta gives riſe to two ſmall Arteries, called Coronariæ Cordis, which go to the Heart and its Auricles; one of which is ſituated anteriourly, the other poſteriourly, and ſometimes they are three in number.

19. From the upper part of the Arch or Curvature, the Aorta ſends out commonly three, ſometimes four large capital Branches, their Origins being very near each other. When there are four, the two middle Branches are termed Arteriæ Carotides; the other two, Subclaviæ; and both are diſtinguiſhed into Right and Left.

20. When there are but three Branches, which is ofteneſt the Caſe, the firſt is a ſhort Trunk, common to the right Subclavian and Carotid, the ſecond is the left Subclavian, and the third the left Carotid. Sometimes, tho' very rarely, theſe four Arteries unite in two Trunks.

21. The Origin of the left Subclavian terminates the Aorta Aſcendens; but I have ſometimes obſerved four Branches, the firſt three of which were thoſe already mentioned, and the fourth a diſtinct Trunk of the left vertebral Artery.

22. It muſt be obſerved that theſe large Branches which ariſe from the Curvature of the Aorta, are ſituated obliquely; the firſt, or that which is moſt on the right hand, lying more forward than the reſt, and the laſt, which is moſt on the left hand, more backward. The firſt and ſecond or middle Branches, are generally in the middle of the Arch, and the third lower down. Sometimes the firſt alone is in the middle; all which Varieties depend on the Obliquity of the Arch.

23. The Carotid Arteries run up directly to the Head, each of them being firſt divided into two, one external, the other internal. The external Artery goes chiefly to the outer parts of the Head and Dura Mater or firſt covering of the Brain. The internal enters the Cranium, through the bony Canal of the Os Petroſum; and is diſtributed through the Brain by a great Number of Ramifications.

24. The ſubclavian Arteries ſeparate laterally and almoſt tranſverſely, each toward that ſide on which it lies, behind and under the Claviculæ, from whence they have their Name. The left ſeems to be ſhorter, and runs more obliquely than the right.

25. The Subclavian on each ſide terminates at the upper Edge of the firſt Rib, between the lower Inſertions of the firſt Scalenus Muſcle; and there, as it goes out of the Thorax, takes the name of Arteria Axillaris.

26. During this Courſe of the ſubclavian Artery, taking in the common Trunk of the right Subclavian, ſeveral Arteries ariſe from it, *viz.* the Mam-

maria Interna, Mediaſtina, Pericardia, Diaphragmatica minor ſive ſuperior, Thymica and Trachealis.

27. The Thymica and Trachealis on each ſide are in ſome Subjects only Branches of one ſmall Trunk which ſprings from the common Trunk of the right Subclavian and Carotid.

28. They are generally ſmall Arteries which run ſometimes ſeparate, and ſometimes partly ſeparate and partly joined.

29. The Subclavian ſends off likewiſe the Mammaria Interna, Vertebrales, Cervicales, and ſometimes ſeveral of the upper Inter-coſtales.

30. The Axillary Artery which is only a Continuation of the Subclavian, from where it goes out of the Thorax, to the Axilla, detaches chiefly the Mammaria Externa or Thoracica Superior, Thoracica Inferior, Scapulares Externæ, Scapularis Interna, Humeralis or Muſcularis, *&c.* Afterwards it is continued by different Ramifications and under different Names, over the whole Arm, all the way to the ends of the Fingers.

31. The ſuperior Portion of the Aorta Deſcendens gives off the Arteriæ Bronchiales, which ariſe ſometimes by a ſmall common Trunk, ſometimes ſeparate, and ſometimes do not come immediately from the Aorta. It next ſends off the Œſophagææ, which may be looked upon as Mediaſtinæ Poſteriores; and then the Inter-coſtales from its poſterior Part, which in ſome Subjects come all from this Portion of the Aorta, in others only the loweſt eight or nine.

32. The ſmall anteriour Arteries here mentioned are generally at their Origins, ſingle and in uneven Numbers, but they divide ſoon after, toward the Right and Left.

33. The inferior Portion of the deſcending Aorta, as it paſſes through the Diaphragm, gives off the Diaphragmaticæ Inferiores or Phrenicæ, which however do not always come immediately from the Aorta. Afterwards it ſends off ſeveral Branches anteriourly, poſteriourly and laterally.

34. The anterior Branches are the Cæliaca which ſupplies the Stomach, Liver, Spleen, Pancreas, *&c.* the Meſenterica Superior which goes chiefly to the Meſentery, to the ſmall Inteſtines, and that part of the great Inteſtines, which lies on the right ſide of the Abdomen; the Meſenterica Inferior, which goes to the great Inteſtines on the left Side and produces the Hemorrhoidalis Interna; and laſtly, the right and left Arteriæ Spermaticæ.

35. The poſterior Branches are the Arteriæ Lumbares, of which there are ſeveral Pairs, and the Sacræ which do not always come from the Trunk of the Aorta.

36. The lateral Branches are the Capſulares and Adipoſæ, the Origin of which often varies; the Renales formerly termed Emulgentes, and the Iliacæ which terminate the Aorta by the Bifurcation already mentioned.

37. The Iliac Artery on each ſide is commonly divided into the external or anteriour, and internal or poſteriour.

38. The internal Iliaca is likewiſe named Arteria Hypogaſtrica; and its Ramifications are diſtributed to the Viſcera contained in the Pelvis, and to the neighbouring Parts, both internal and external.

39. The Iliaca Externa, which is the true Continuation of the Iliac Trunk and alone deſerves that name, goes on to the Inguen, and then out of the Abdomen, under the Ligamentum Falloppii; having firſt detached the Epigaſtrica which goes to the Muſculi Abdominis Recti. Having quitted the Abdomen, it commences Arteria Cruralis, which runs down upon the Thigh, and is diſtributed by many Branches and Ramifications to all the lower Extremity.

40. I shall now go on to examine particularly all the capital or original Branches of the Aorta, from their Origin, to the Entry of them and of their Ramifications into all the parts of the Body, and all the different Viſcera and Organs.

*Arteriæ Cardiacæ ſive Coronariæ Cordis.*

41. The cardiac or coronary Arteries of the Heart, ariſe from the Aorta immediately on its leaving the Heart. They are two in number, and according to the natural Situation of the Heart, one is rather ſuperiour than anteriour, the other rather inferiour than poſteriour.

42. They go out near the two Sides of the pulmonary Artery, which having firſt ſurrounded, they afterward run upon the Baſis of the Heart in form of a kind of Crown or Garland, from whence they are called Coronariæ; and then purſue the ſuperficial Traces of the Union of the two Ventricles, from the Baſis of the Heart to the Apex.

43. They ſend communicating Branches to each other, which are afterward loſt in the Subſtance of the Heart, as ſhall be ſhewn more particularly in deſcribing that Organ.

44. We ſometimes meet with a third coronary Artery which ariſes from the Aorta more backward, and is ſpent on the poſteriour or lower ſide of the Heart.

*The Arteriæ Carotides in general.*

45. The carotid Arteries are commonly demonſtrated after the Subclavian; but I chooſe to deſcribe them firſt, that I may afterwards be able to purſue the Arteries of the Thorax ariſing partly from the Subclaviæ and partly from the Aorta Deſcendens, without interruption.

46. These Arteries are two in Number, one called the right Carotid, the other the left. They ariſe near each other, from the Curvature or Arch of the Aorta, the left immediately; the right moſt commonly from the Trunk of the Subclavia on the ſame Side, as has been already obſerved.

47. They run upon each ſide of the Trachea Arteria, between it and the internal jugular Vein, as high as the Larynx, without any Ramification. During this Courſe, therefore, they may be named carotid Trunks or general, common and original Carotids. Each of theſe Trunks is afterwards ramified in the following manner.

48. The Trunk having reached as high as the Larynx, is divided into two large Branches or particular Carotids, one named external, the other internal, becauſe the firſt goes chiefly to the external parts of the Head, the ſecond enters the Cranium and is diſtributed to the Brain.

49. The external Carotid is anteriour, the internal, poſteriour; and the external is even ſituated more inward and nearer the Larynx than the other;

but the common Names may ſtill be retained, as being taken not from their Situation, but from their Diſtribution.

*Arteria Carotis Externa.*

50. The external Carotid is the ſmalleſt, and yet appears by its Direction to be a Continuation of the common Trunk. It runs inſenſibly outward, between the external Angle of the lower Jaw, and the parotid Gland, which it ſupplies as it paſſes. Afterwards it aſcends on the foreſide of the Ear, and ends in the Temples.

51. In this Courſe it ſends off ſeveral Branches, which may well enough be divided into anteriour or internal, and poſteriour or external; and the principal Branches of each kind are theſe.

52. The firſt anteriour or internal Branch goes out from the very Origin of the Carotid on the inſide; and having preſently afterward taken a little turn, and ſent off Branches to the jugular Glands near it, to the Fat and Skin; it runs tranſverſely, and is diſtributed to the Glandulæ Thyroidææ, and to the Muſcles and other parts of the Larynx; for which reaſon I name it Laryngæa or Gutturalis Superior. It likewiſe ſends ſome Branches to the Pharynx and Muſcles of the Os Hyoides.

53. The ſecond anteriour Branch paſſes over the neareſt Cornu of the Os Hyoides, to the Muſcles of that Bone and of the Tongue; and to the Glandulæ Sublinguales; afterwards paſſing before the Cornu of the Os Hyoides, it loſes itſelf in the Tongue, from whence it has been called Arteria Sublingualis; and it is the ſame Artery which others have named Ranina.

54. The third Branch or Arteria Maxillaris Inferior goes to the maxillary Gland, to the ſtyloide and maſtoide Muſcles, to the parotid and ſublingual Glands, to the Muſcles of the Pharynx, and to the ſmall Flexors of the Head.

55. The fourth Branch, which I name Arteria Maxillaris Externa, paſſes anteriourly on the maſſeter Muſcle, and middle of the lower Jaw near the Chin, from whence it has a denomination in ſome Languages, which cannot be expreſſed in *Engliſh*. Afterwards it runs under the Muſculus Triangularis Labiorum, which it ſupplies as well as the Buccinator and the Quadratus Menti.

56. It ſends off a particular Branch, very much contorted, which divides at the angular commiſſure of the Lips, and running in the ſame manner along the ſuperiour and inferiour Portions of the Muſculus Orbicularis, it communicates on both ſides with its fellow, and thereby forms a kind of Arteria Coronaria Labiorum.

57. Afterwards it aſcends towards the Nares, and is diſtributed to the Muſcles, Cartilages and other parts of the Noſe, ſending down ſome Twigs, which communicate with the coronary Artery of the Lips. Laſtly, it reaches the great Angle of the Eye, and is ramified and loſt on the Muſculus Orbicularis Palpebrarum, Superciliaris and Frontalis. Through all this Courſe, it is named Arteria Angularis.

58. The fifth Branch ariſes over-againſt the Condyle of the lower Jaw, and as it is very conſiderable, I call it Maxillaris Interna. It paſſes behind

the Condyle, and having given off a Twig among the Muſculi Pterygoïdæi; it is divided into three principal Branches.

59. The firſt Branch goes through the inferiour Orbitary or Spheno-maxillary Fiſſure, to the Orbit, after having ſupplied the Muſculi Periſtaphylini, and the glandulous Membrane of the poſteriour Nares, through the Foramen Spheno-Palatinum. I name this Branch Spheno-Maxillaris.

60. It is diſtributed inferiourly and laterally to the Parts contained in the Orbit, and detaches a ſmall ſubaltern Branch through the Extremity of the ſuperiour Orbitary or ſphenoidal Fiſſure, which enters the Cranium, and is ſpent upon the Dura Mater, communicating there with the other Artery of the Dura Mater, which enters by the Foramen Spinale of the ſphenoidal Bone.

61. It ſends off likewiſe another ſubaltern Branch, which paſſes through the poſteriour Opening of the orbitary Canal, and having furniſhed the maxillary Sinus and the Teeth, goes out by the inferiour orbitary Hole, and on the Cheek communicates with the angular Artery.

62. The ſecond of the three Branches runs through the Canal of the lower Jaw, and being diſtributed to the Alveoli and Teeth, goes out at the Hole near the Chin, and loſes itſelf in the neighbouring Muſcles, communicating with the Rami of the Arteria Maxillaris externa.

63. The third Branch of the Maxillaris interna runs up between the internal and external Carotids, paſſes through the Foramen Spinale of the ſphenoidal Bone, and is diſtributed to the Dura Mater by ſeveral Ramifications which run forward, upward and backward; the uppermoſt communicating with thoſe on the other ſide, above the longitudinal Sinus of the Dura Mater.

64. This Artery of the Dura Mater which may be termed Spheno-ſpinalis, to diſtinguiſh it from thoſe that go to the ſame part by another Courſe, ariſes ſometimes from the Trunk of the external Carotid, behind the Origin of the Laryngæa or Gutturalis ſuperior, and ſometimes from the firſt Ramus of the Maxillaris interna, juſt before it enters the ſpheno-maxillary Fiſſure.

65. The ſixth anteriour or internal Branch which is very ſmall, is ſpent on the Muſculus Maſſeter.

66. The firſt external or poſteriour Branch is named Arteria Occipitalis. It paſſes obliquely before the internal jugular Vein, and having Twigs to the Muſculus Stylo-Hyoidæus, Stylo-Gloſſus and Digaſtricus, it runs between the Styloide and maſtoide Apophyſes, along the maſtoide Groove, and goes to the Muſcles and Integuments which cover the Os Occipitis, turning ſeveral times in an undulating Manner as it aſcends backward.

67. It communicates by a deſcending Branch with the vertebral and cervical Arteries, as has been already ſaid; near the top of the Head, it communicates likewiſe with the poſteriour Branches of the temporal Artery, and it ſends a Branch to the Foramen Maſtoidæum.

68. The ſecond external Branch ſpreads itſelf on the outward Ear, by a great many ſmall Twigs on each ſide, ſeveral of which run inward, and furniſh the Cartilages, Meatus Auditorius, Skin of the Tympanum and internal Ear.

69. THE Trunk of the external Carotid aſcends afterward above the Zygoma, paſſing between the Angle of the lower Jaw and Parotid Gland, and forms the Temporal Artery, which divides into an anteriour, middle and poſteriour Branch.

70. THE anteriour Branch of the temporal Artery goes to the Muſculus Frontalis, communicates with the Arteria Angularis, and ſometimes gives off a very ſmall Artery, which pierces the internal Apophyſis of the Os Malæ, all the way to the Orbit. The middle Branch goes partly to the Muſculus Frontalis, partly to the Occipitalis. The poſteriour Branch goes to the Occiput, and communicates with the Arteria Occipitalis. All theſe Branches likewiſe furniſh the Integuments.

*Arteria Carotis Interna.* 71. THE internal carotid Artery leaving the general Trunk, is at firſt a little incurvated, appearing as if either it were the only Branch of that Trunk, or a Branch of the Trunk of the external Carotid. Sometimes the Curvature is turned a little outward, and then more or leſs inward, paſſing behind the neighbouring external Carotid.

72. IT is ſituated a little more backward than the Carotis Externa, and generally runs up without any Ramification, as high as the lower Orifice of the great Canal of the Apophyſis Petroſa of the Os Temporis. It enters this Orifice directly from below upward, and afterward makes an Angle according to the Direction of the Canal, the reſt of which it paſſes horizontally, being covered by a Production of the Dura Mater.

73. AT the end of this Canal it is again incurvated from below upward, and enters the Cranium through a Notch of the ſphenoidal Bone. Then it bends from behind, forward, and makes a third Angle on the ſide of the Sella Sphenoidalis; and again a fourth, under the clinoide Apophyſis of that Sella.

74. As it leaves the bony Canal to enter the Cranium, it ſends off a Branch through the ſphenoidal Fiſſure to the Orbit and Eye; and ſoon afterward, another, through the Foramen Opticum, by which it communicates with the external Carotid.

75. AFTERWARDS the internal Carotid runs under the Baſis of the Brain to the ſide of the Infundibulum, where it is at a ſmall diſtance from the internal Carotid of the other ſide, and there it commonly divides into two principal Branches, one anteriour, and one poſteriour.

76. THE anteriour Branch runs forward under the Brain, firſt ſeparating from that on the other ſide, then coming nearer again, it unites with it by an Anaſtomoſis or Communication in the Interſtice between the olfactory Nerves. Afterwards having ſent off ſome ſmall Arteries, which accompany theſe Nerves, it leaves its fellow, and divides into two or three Branches.

77. THE firſt of theſe Branches goes to the anteriour Lobe of the Brain; the ſecond, which is ſometimes double, is inverted on the Corpus Calloſum, to which it gives ſome Ramifications, as alſo to the Falx of the Dura Mater, and middle Lobe of the Brain. The third, which in ſome Subjects is a diſtinct Branch, in others only a Diviſion of the ſecond, goes to the poſteriour

Lobe of the Brain. This might be look'd upon as a third principal Branch lying between the other two.

78. The poſteriour Branch communicates firſt of all, with the vertebral Artery of the ſame ſide, and then divides into ſeveral Rami which run between the ſuperficial Circumvolutions of the Brain; and are ramified in many different Directions on and between theſe Circumvolutions, all the way to the bottom of the Sulci.

79. All theſe Ramifications are covered by the Pia Mater, in the Duplicature of which they are diſtributed, and form capillary reticular Textures in great numbers; and afterwards they are loſt in the inner Subſtance of the Brain. The anteriour and middle Branches produce the ſame kind of Ramifications, and the anteriour in particular, ſends a Twig to the Corpus Calloſum.

80. The ſubclavian Arteries are named from their Situation near the Claviculæ, in the tranſverſe direction of which they run. They are two in number, one Right, the other Left; and they ariſe from the Arch of the Aorta, on each ſide of the left Carotid, which commonly lies in the middle between them; but when both Carotids go out ſeparately, they both lie between the Subclaviæ. Theſe Arteries terminate, or rather change their Name, above the middle of the two firſt Ribs, between the anteriour Inſertions of the Muſculi Scaleni. *Arteria Subclavia.*

81. The right Subclavian is larger at the beginning than the left, when it produces the right Carotid; its Original is likewiſe more anteriour and higher, becauſe of the Obliquity of the Arch of the Aorta; for which reaſon alſo the left is ſhorter than the right, and runs more obliquely. Both of them are diſtributed much in the ſame manner; and therefore the Deſcription of one may likewiſe be applied to the other.

82. The right Subclavian, the longeſt of the two, gives off, firſt of all, ſmall Arteries to the Mediaſtinum, Thymus, Pericardium, Aſpera Arteria, *&c.* which are named Mediaſtinæ, Thymicæ, Pericardiæ, and Tracheales. Theſe ſmall Arteries ſometimes go out from the Subclavian itſelf, either ſeparately, or by ſmall common Trunks; ſometimes they are Branches of the Mammaria interna, eſpecially the Mediaſtina.

83. Afterward this right Subclavian, at about a Finger's breadth from its Origin, often produces the common Carotid of the ſame ſide; and at a ſmall Finger's breadth from the Carotid, it gives off commonly three conſiderable Branches, *viz.* the Mammaria interna, Cervicalis, and Vertebralis, and ſometimes an intercoſtal Artery which goes to the firſt Ribs, called Intercoſtalis ſuperior.

84. The Arteria Thymica communicates with the Mammaria interna, and ſometimes ariſes from the anteriour middle part of the common Trunk of the Subclavian and Carotid. The Thymus receives likewiſe ſome Rami from the Mammaria interna, and Intercoſtalis ſuperior. The ſame Obſervation may be applied to the Mediaſtina and Pericardia. *Arteria Thymica.*

*Arteria Pericardia.* 85. The Pericardia ariſes much in the ſame manner with the Thymica, and runs down upon the Pericardium all the way to the Diaphragm, to which it ſends ſome ſmall Ramifications.

*Arteria Mediaſtina.* 86. The Mediaſtina ariſes ſometimes immediately after the Thymica, and is diſtributed principally to the Mediaſtinum.

*Arteria Trachealis.* 87. The Trachealis, which may likewiſe be named Gutturalis inferior, runs up from the Subclavia, in a winding Courſe, along the Aſpera Arteria, to the Glandulæ Thyroidææ, and Larynx, detaching ſmall Arteries to both ſides, one of which runs to the upper part of the Scapula.

*Arteria Mammaria Interna.* 88. The internal mammary Artery comes from the anteriour and lower ſide of the Subclavia, near the middle of the Clavicula, and runs down for about one Finger's breadth, behind the Cartilages of the true Ribs, an Inch diſtant from the Sternum.

89. In its paſſage it ſends Rami to the Thymus, Mediaſtinum, Pericardium, Pleura, and intercoſtal Muſcles. It likewiſe detaches other Branches, through theſe Muſcles, and between the Cartilages of the Ribs, to the Pectoralis Major, and other neighbouring muſcular Portions, to the Mammæ, Membrana Adipoſa and Skin.

90. Several of theſe Rami communicate by Anaſtomoſes, with the Mammaria externa, and other Arteries of the Thorax, eſpecially in the Subſtance of the Pectoralis Major, and likewiſe with the Intercoſtals. Afterwards it goes out of the Thorax, on one ſide of the Appendix Enſiformis, and is loſt in the Muſculus Abdominis Rectus, a little below its upper part; communicating at this place, by ſeveral ſmall Ramifications with the Arteria Epigaſtrica; and in its Courſe, it gives Branches to the Peritonæum, and to the anteriour Parts of the oblique and tranſverſe Muſcles of the Abdomen.

*Arteria Cervicalis.* 91. The cervical Artery ariſes from the upper ſide of the Subclavian, and is preſently afterward divided into two, which come out ſometimes ſeparately, ſometimes by a ſmall common Trunk. The largeſt of theſe two Arteries is anteriour, the other poſteriour.

92. The anteriour Cervicalis, running behind the Carotid of the ſame ſide, is diſtributed to the Muſculus Coraco-Hyoidæus, Maſtoidæus, Cutaneus, Sterno-Hyoidæus, [and Sterno-Thyroidæus, to the jugular Glands, the Aſpera Arteria, the Muſcles of the Pharynx, Bronchia, Œſophagus, and to the anteriour Muſcles, which move the Neck and Head. This Artery has been obſerved to ſend out the Intercoſtalis Superior.

93. The poſteriour Cervicalis ariſes ſometimes a little after the Vertebralis, and ſometimes from that Artery. It paſſes under the tranſverſe Apophyſis of the laſt Vertebra of the Neck; and ſometimes through a particular Hole in that Apophyſis; and from thence runs up backward in a winding Courſe, on the vertebral Muſcles of the Neck, and then returns in the ſame manner.

94. It communicates with a deſcending Branch of the occipital Artery, and with another of the vertebral Artery above the ſecond Vertebra. It is

diſtributed to the Muſculi Scaleni, Angularis Scapulæ, and Trapezius, and to the jugular Glands and Integuments.

95. THE vertebral Artery goes out from the poſteriour and upper ſide of the Subclavian, almoſt oppoſite to the Mammaria Interna and Cervicalis. It runs up through all the Holes in the Tranſverſe Apophyſes of the Vertebræ of the Neck, and in its paſſage ſends off little Twigs through the lateral Notches of theſe Vertebræ, to the Medulla Spinalis and its Coverings. It alſo gives Arteries to the vertebral Muſcles, and to other Muſcles near them. *Arteria Vertebralis.*

96. As it paſſes through the tranſverſe Hole of the ſecond Vertebra, it is generally incurvated, to accommodate it ſelf to the particular Obliquity of this Foramen, mention'd in the Deſcription of the Sceleton N° 479. And between this Hole and that in the firſt Vertebra, it takes another larger turn in a contrary direction to the former. Having paſſed the tranſverſe Hole of the firſt Vertebra, it is conſiderably incurvated a third time, from before backwards, as it goes through the ſuperiour and poſteriour Notch in this Vertebra.

97. AT this third Curvature, it ſends off a ſmall Branch which is ramified on the outer and poſteriour Parts of the Occiput, and communicates with the Cervical and Occipital Arteries. Having afterwards reached the great Foramen of the Os Occipitis, it enters the Cranium and pierces the Dura Mater; and on theſe accounts it may be named Arteria Occipitalis poſterior, to diſtinguiſh it from the other which is lateral.

98. As ſoon as it enters the Cranium, it ſends ſeveral ſmall Ramifications to the back part of the Medulla Oblongata, and to the Corpora Olivaria and Pyramidalia, which are likewiſe ſpread on the back ſides of the fourth Ventricle of the Brain, and from the Plexus Choroides of the Cerebellum.

99. AFTERWARDS it advances on the Apophyſis Baſilaris of the Os Occipitis, inclining by ſmall degrees toward the vertebral Artery of the other ſide, all the way to the Extremity of that Apophyſis, where they both join in one common Trunk, which may be named Arteria Baſilaris.

100. THE Arteria Baſilaris runs forward under the great tranſverſe Protuberance of the Medulla oblongata, to which it gives Ramifications, as well as to the neighbouring Parts of the Medulla. Sometimes this Artery divides again near the Extremity of the Apophyſis Baſilaris into two lateral Branches, which communicate with the poſteriour Branches of the two internal Carotides, and are loſt in the poſteriour Lobe of the Brain. *Arteria Baſilaris.*

101. THE ſpinal Arteries are two in number, one anteriour and one poſteriour; both produced by both Vertebrales, each of which, as ſoon as it enters the Cranium ſends out a ſmall Branch, by the Union of which, the poſteriour Spinalis is formed. Afterwards the Vertebrales advancing on the Apophyſis Baſilaris or Production of the Occipital Bone, detach backward two other ſmall Branches, which likewiſe meet, and by their Union form the Spinalis Anterior. Theſe ſpinal Arteries run down on the fore and back ſides of the Medulla Spinalis, and by ſmall tranſverſe Ramifications, communicate with thoſe which the Intercoſtal and Lumbar Arteries ſend to the ſame part. *Arteriæ Spinales.*

*Arteria Auditoria Interna.*

102. THE internal auditory Artery goes off from each ſide of the Arteria Baſilaris, to the Organ of Hearing, accompanying the auditory Nerve, having firſt furniſhed ſeveral ſmall Twigs to the Membrana Arachnoides.

*Arteria Meningæa poſterior.*

103. THE poſterior Meningæa ariſes from the ſame Trunk with the Auditoria Interna, and goes to the back part of the Dura Mater, on the Occipital and Temporal Bones, and likewiſe ſupplies the neighbouring Lobes of the Brain.

*Arteria Intercoſtalis ſuperior.*

104. WHEN the ſuperiour intercoſtal Artery does not go out from the Trunk of the Aorta Deſcendens, it commonly ariſes from the lower ſide of the Subclavian, and runs down on the inſide of the two, three or four uppermoſt true Ribs, near their Heads, and ſends off under each Rib, a Branch which runs along the lower Edge, and ſupplies the Intercoſtal Muſcles and neighbouring Parts of the Pleura.

105. THESE Branches or particular Intercoſtal Arteries communicate with each other at different diſtances by ſmall Rami, which run upward and downward from one to the other, on the Intercoſtal Muſcles.

106. THEY likewiſe give Branches to the Muſculi Sterno-Hyoidæi, Subclavius, Vertebrales, and Bodies of the Vertebræ; and alſo to the Pectoralis Major and Minor, piercing the Intercoſtal Muſcles; and laſtly, they ſend Branches through the Notches of the firſt four Vertebræ to the Medulla Spinalis and its Coverings.

107. SOMETIMES the ſuperiour common Intercoſtal Artery comes from the Cervicalis, and not immediately from the Subclavia. Sometimes it ariſes from the Aorta Deſcendens, either by ſmall ſeparate Arteries or by a common Trunk, which divides as it runs obliquely up upon the Ribs. Laſtly, it ſometimes ariſes from the neareſt Bronchialis, or from ſeveral Bronchiales together.

*Ductus Arterioſus in Ligamentum verſus.*

108. THE Ductus Arterioſus, which is found only in the Fœtus and in very young Children, ariſes from the Aorta Deſcendens, immediately below the left Subclavian Artery. In Adults, this Duct is ſhrunk up and cloſed and appears only like a ſhort Ligament adhering by one end to the Aorta, and by the other to the Pulmonary Artery, ſo that in reality it deſerves no other Name than that of Ligamentum Arterioſum.

*Arteria Bronchialis.*

109. THE Bronchial Arteries go ſometimes from the foreſide of the ſuperiour deſcending Aorta, ſometimes from the firſt Intercoſtal, and ſometimes from the Arteria Œſophagæa. Sometimes they ariſe ſeparately from each ſide, to go to each Lung, and ſometimes by a ſmall common Trunk, which afterwards ſeparates towards the right and left hand, at the Bifurcation of the Aſpera Arteria, and accompany the Ramifications of the Bronchia.

110. THE Bronchial Artery on the left ſide often comes from the Aorta, while the other ariſes from the ſuperior Intercoſtal on the ſame ſide, which Variety is owing to the Situation of the Aorta. Sometimes there is another Bronchial Artery which goes out from the Aorta poſteriourly, near the ſuperiour Intercoſtal, above the Bronchialis anterior.

111. In the Year 1719, I obſerved a very plain communication of the Branches of the left pulmonary Vein, with the Rami of an Arteria Œſophagæa, which came from the firſt left Intercoſtal, together with a Bronchial Artery of the ſame ſide.

112. The Bronchialis gives a ſmall Branch to the neighbouring Auricle of the Heart, which communicates with the Arteria Coronaria.

113. In the Year 1719 or 1720, I diſcovered a communication between the left Bronchial Artery and the Vena Azygos; and in the Month of *Auguſt* 1721, I ſaw a Branch of this Bronchial Artery joined by an Anaſtomoſis to the Body of the Azygos.

*Arteriæ OEſophagææ.*

114. The Œſophagææ are generally two or three in number, ſometimes but one. They ariſe anteriourly from the Aorta Deſcendens, and are diſtributed to the Œſophagus, *&c.* Sometimes the uppermoſt Œſophagæa produces a Bronchial Artery.

*Arteriæ Intercoſtales Inferiores.*

115. The inferiour Intercoſtals are commonly ſeven or eight on each ſide, and ſometimes tên, when the ſuperiour Intercoſtals ariſe likewiſe from the Aorta Deſcendens; in which Caſe theſe run obliquely upward, as has been already ſaid.

116. They ariſe along the backſide of the deſcending Aorta in Pairs, all the way to the Diaphragm, and run tranſverſely toward each ſide, on the Bodies of the Vertebræ. Thoſe on the right ſide paſs behind the Vena Azygos; and afterwards they all run to the Intercoſtal Muſcles, along the lower Edge of the Ribs, all the way to the Sternum or near it.

117. They ſend Branches to the Pleura, to the vertebral Muſcles, to thoſe Muſcles which lie on the outſides of the Ribs, and to the upper Portions of the Muſcles of the Abdomen; and they communicate with the Arteriæ Epigaſtricæ and Lumbares.

118. Sometimes inſtead of going out from the Aorta in Pairs, they ariſe by ſmall common Trunks, which afterwards divide, and ſend an Artery to each neighbouring Rib.

119. Before they take their Courſe along the Ribs, each of them detaches one Branch between the tranſverſe Apophyſes on both ſides, to the vertebral Muſcles, and another which enters the great Canal of the Spina Dorſi. Each of theſe latter Branches divides at leaſt into two ſmall Arteries, one of which runs tranſverſely on the anteriour ſide of the Canal, the other on the poſteriour ſide. Both of them communicate with the like Arteries from the other ſide of the Spine, in ſuch a manner, as to form a kind of arterial Rings, which likewiſe communicate with each other by other ſmall Ramifications. The ſame is to be obſerved in the Arteriæ Lumbares.

120. Afterwards each Intercoſtal Artery having reached the middle of the Rib or a little more, divides into two principal Branches, one internal, the other external. Soon after this Diviſion, the Arteries that run upon the falſe Ribs, ſeparate a little from them, being gradually bent downward one after another, and are ſpread upon the Abdominal Muſcles. They are likewiſe diſtributed to other neighbouring Muſcles, and particularly

to thoſe of the Diaphragm, almoſt in the ſame manner with the Arteriæ Phrenicæ. They alſo communicate with the Lumbares, and ſometimes with Branches of the Hypogaſtricæ.

*Arteriæ Axillares.*

121. The Subclavian Artery having left the Thorax immediately above the firſt Rib, in the Interſtice left between the Portions of the Scalenus, there receives the name of Axillaris, becauſe it paſſes under the Axilla.

122. In this Courſe it gives off from its inſide, a ſmall Branch to the inſide of the firſt Rib; and afterwards, four or five principal Branches, *viz.* The Thoracica Superior or Mammaria Externa, Thoracica Inferior, Muſcularis or Scapularis Externa, Scapularis Interna, and Humeralis.

*Arteria Thoracica Superior.*

123. The ſuperior Thoracica or external mammary Artery, runs down in a winding Courſe on the lateral parts of the Thorax, and croſſes the Ribs. It gives Branches to the two pectoral Muſcles, to the Mamma, Muſculus Subclavius, Serratus Major, Latiſſimus Dorſi, and to the upper Portions of the Coraco-Brachialis and Biceps.

124. These Branches are ſometimes ſeparate for ſome ſpace; and one of them in particular runs down between the Deltoides and Pectoralis Major, together with the Vena Cephalica to which it adheres very cloſely, the Extremity of it piercing the Coat of that Vein, as if there were an Anaſtomoſis between them. Another ſometimes runs between the Muſculus Brachiæus and Anconæus Internus, which communicates with a Branch of the Radial Artery.

*Arteria Thoracica Inferior.*

125. The inferior Thoracic Artery runs along the inferior Coſta of the Scapula, to the Muſculus Subſcapularis, Teres Major and Minor, Infra-Spinatus, Latiſſimus Dorſi, Serratus Major, and the neighbouring Intercoſtal Muſcles, communicating with the Arteriæ Scapulares.

*Arteriæ Scapulares.*

126. The external Scapulary Artery paſſes through the Notch in the ſuperior Coſta of the Scapula, to the Muſculus Supra-ſpinatus and Infra-ſpinatus, Teres Major and Minor, and to the Articulation of the Scapula, with the Os Humeri.

127. The internal Scapularis ariſes from the Axillary Artery near the Axilla, and runs backward, to be diſtributed to the Subſcapularis, giving Branches to the Serratus Major, to the Axillary Glands, and to the Teres Major, upon which it is ramified in different manners. It likewiſe ſends Rami to the Infra-Spinatus and upper Portion of the Anconæi.

*Arteria Humeralis.*

128. The humeral Artery ariſes from the lower and foreſide of the Axillaris, and runs backward between the Head of the Os Humeri and Teres Major, ſurrounding the Articulation, till it reaches the poſteriour part of the Deltoides to which it is diſtributed.

129. During this Courſe, it gives ſeveral Branches to the ſuperior Portions of the Anconæi, to the Capſular Ligament of the Joint of the Shoulder, and to the Os Humeri itſelf, through ſeveral Holes immediately below the great Tuberoſity of the Head of that Bone. It likewiſe communicates with the Scapulary Artery.

130. Opposite to the Origin of this humeral Artery, the Axillaris ſends off another ſmall Branch, which runs in a contrary direction between

the Head of the Os Humeri and the common upper part of the Biceps and Coraco-Brachialis; and having given Branches to the Vagina and Channel of the Biceps, and to the Perioſteum, afterwards joins the principal Humeralis.

131. The Axillary Artery having given off theſe Branches, paſſes immediately behind the Tendon of the Pectoralis Major, where it changes its former Name for that of Arteria Brachialis. It runs down on the inſide of the Arm over the Muſculus Coraco-Brachialis, and Anconæus Internus, and along the inner Edge of the Biceps behind the Vena Baſilica, giving ſmall Branches on both ſides to the neighbouring Muſcles, to the Perioſteum, and to the Bone. *Arteria Brachialis.*

132. Between the Axilla and middle of the Arm, it is covered only by the Skin and Fat; but afterwards it is hid under the Biceps, and runs obliquely forward as it deſcends; being at ſome diſtance from the internal Condyle, but it does not reach the middle of the Fold of the Arm.

133. Between the Axilla and this place, it ſends off many Branches to the Infra-Spinatus, Teres Major and Minor, Subſcapularis, Latiſſimus Dorſi, Serratus Major, and other neighbouring Muſcles, to the common Integuments and even to the Nerves. Below the Fold of the Arm, it divides into two principal Branches, one called Arteria Cubitalis, the other Radialis.

134. From its upper and inner part it ſends off a particular Branch, which runs obliquely downward and backward over the Anconæi, and then turns forward again near the external Condyle, where it communicates with a Branch of the Arteria Radialis.

135. Immediately below the Inſertion of the Teres Major, it gives off another Branch, which runs from within outwards, and from behind forward, round the Os Humeri; and deſcends obliquely forward between the Muſculus Brachiæus, and Anconæus Externus, to both which it is diſtributed in its paſſage. Having afterwards reached the external Condyle, it unites with the Branch laſt mentioned, and likewiſe communicates with a Branch of the Arteries of the Fore-Arm, ſo that there is here a triple Anaſtomoſis.

136. About the breadth of a Finger below this ſecond Branch, the Brachial Artery ſends off a third, which runs down toward the internal Condyle, and communicates with other Branches of the Arteries of the Fore-Arm, as we ſhall ſee hereafter.

137. About the middle of the Arm, or a little lower, much about the place where the Brachial Artery begins to be covered by the Biceps; it ſends off a Branch, which is diſtributed to the Perioſteum, and penetrates the Bone, between the Muſculus Brachiæus and Anconæus Internus.

138. About an Inch lower, it gives off another Branch, which having furniſhed Ramifications to the Anconæus Internus, runs over the inner Condyle, and likewiſe communicates with Branches of the Arteries of the Fore-Arm.

139. Having got below the middle of the Arm, the Brachial Artery detaches another Branch which runs behind the inner Condyle in company with a conſiderable Nerve; and having paſſed over the Muſcles inſerted in this

Condyle, it communicates with that Branch of the Cubital Artery, which encompaſſes the Fold of the Arm.

140. A LITTLE lower, it ſometimes ſends out another Branch which paſſes on the foreſide of the inner Condyle, and then communicates with a Branch which runs up from the Cubital Artery. Theſe three communicating Branches are termed Collateral Arteries.

141. THE common Trunk of the Brachial Artery having reached the Fold of the Arm, runs together with a Vein and a Nerve immediately under the Aponeuroſis of the Biceps, and paſſes under the Vena Mediana, detaching Branches on each ſide to the neighbouring Muſcles.

142. ABOUT a large Finger's breadth beyond the Fold of the Arm, this Artery divides into two principal Branches, one inner or poſteriour, named Cubitalis; the other outer or anteriour, named Radialis, as has been already ſaid.

143. FROM this Bifurcation, the Brachial Artery ſends Branches on each ſide, to the Supinator Longus, Pronator Teres, Fat and Skin. It ſometimes tho' very rarely happens, that this Artery is divided from its Origin into two large Branches, which run down on the Arm, and afterwards on the Fore-Arm, where they have the Names of Cubitalis and Radialis.

*Arteria Cubitalis.*

144. THE Cubital Artery ſinks in between the Ulna, and the upper Parts of the Pronator Teres, Perforatus, Ulnaris Gracilis, and Radialis Internus; then leaving the Bone, it runs down between the Perforatus and Ulnaris Internus, all the way to the Carpus and great tranſverſe Ligament. In this Courſe it winds and turns ſeveral ways and ſends out ſeveral Branches.

145. THE firſt is a ſmall Artery which runs inward to the inner Condyle, and then turns upward like a kind of Recurrent, to communicate by ſeveral Branches with the Collateral Arteries of the Arm already mentioned, and particularly with the third. A little lower down, another ſmall Branch goes off, which having run upward a little way, and almoſt ſurrounded the Articulation, communicates with the ſecond collateral Artery of the Arm, between the Olecranum and inner Condyle.

146. AFTERWARDS the Cubital Artery having in its Courſe between the Heads of the Ulna and Radius, reached the Interoſſeous Ligament, ſends off two principal Branches, one internal, the other external, which I call the Interoſſeous Arteries of the Fore-Arm.

147. THE external Artery pierces the Ligament about three Fingers breadth below the Articulation; and preſently afterward, gives off a Branch, which runs up like a Recurrent toward the external Condyle of the Os Humeri under the Ulnaris externus, and Anconæus minimus, to which it is diſtributed, as alſo to the Supinator Brevis; and it communicates with the Collateral Arteries of the Arm on the ſame ſide.

148. AFTERWARD this external interoſſeous Artery runs down on the Outſide of the Ligament, and is diſtributed to the Ulnaris externus, Extenſor Digitorum communis, and to the Extenſores Pollicis, Indicis and minimi Digiti; communicating with ſome Branches of the internal interoſſeous Artery.

149. Having reached the lower Extremity of the Ulna, it unites with a Branch of the internal interoſſeous Artery, which at this place runs from within outward; and is diſtributed together with it on the convex ſide of the Carpus and Back of the Hand; communicating with the Arteria Radialis and with a Branch of the Cubitalis, which will be mentioned hereafter.

150. By theſe Communications, this Artery forms a ſort of irregular Arch, from whence Branches are detached to the external interoſſeous Muſcles, and to the external lateral parts of the Fingers.

151. The internal interoſſeous Artery runs down very cloſe to the Ligament, till it reaches below the Pronator Teres, between which and the Pronator Quadratus, it perforates the Ligament, and goes to the convex ſide of the Carpus and Back of the Hand, where it communicates with the external interoſſeous Artery, with the Radialis and internal Branches of the Cubitalis.

152. From the Origin of the two Interoſſeæ, the cubital Artery runs down between the Perforatus, Perforans, and Ulnaris Internus, along the Ulna, ſending Branches to the neighbouring parts. Below the internal Interoſſea, it ſometimes ſends off a Branch which runs down between the Flexor Pollicis, Radialis Internus and Perforatus, to which it is diſtributed all the way to the Carpus, where it runs under the internal annular Ligament and communicates on the Hand with Branches of the Arteria Radialis.

153. Afterward the cubital Artery paſſes over the internal tranſverſe Ligament of the Carpus, by the ſide of the Os Piſiforme, and having furniſhed the Skin, Palmaris Brevis and Metacarpius, it ſlips under the Aponeuroſis Palmaris, giving off one Branch to the Hypothenar Minimi Digiti, and another which runs towards the Thumb between the Tendons of the Flexors of the Fingers, and the Baſes of the metacarpal Bones.

154. It likewiſe ſends off a Branch, which running between the third and fourth Bones of the Metacarpus, reaches to the Back of the Hand, where it communicates with the external interoſſeous Artery. Afterwards having ſupplied the interoſſeous Muſcles, it communicates with the Radialis; and they both form an arterial Arch in the hollow of the Hand in the following manner.

155. The Cubitalis having got about two Fingers breadth beyond the internal annular Ligament of the Carpus, forms an Arch, the convex ſide of which is turned to the Fingers, and commonly ſends off three or four Branches. The firſt goes to the inner and back part of the little Finger; and is ſometimes a Continuation or Production of that Branch which goes to the Hypothenar.

156. The other three Branches run in the Interſtices of the four metacarpal Bones, near the Heads of which, each of them is divided into two Branches, which paſs along the two internal lateral parts of each Finger, from the foreſide of the little Finger to the poſterior ſide of the Index incluſively; and at the ends of the Fingers, theſe digital Arteries communicate and unite with each other.

157. Sometimes the Arch of the cubital Artery terminates by a particular Branch in the middle Finger, and in that caſe it communicates with the radial Artery which makes up what the other wants.

158. This Arch ſends likewiſe from its concave Side towards the ſecond Phalanx of the Thumb, a Branch for the lateral internal part thereof, and then ends near the Head of the firſt metacarpal Bone, by a communication with the Radialis, having firſt given a Branch to the foreſide of the Index, and another to the ſide of the Thumb next the former. Theſe communicate at the ends of the Fingers with the neighbouring Branches, as in the other Fingers.

159. This Arch ſends likewiſe ſmall Twigs to the interoſſeous Muſcles, to the Lumbricales, Palmaris, and to other neighbouring Parts; and laſtly, to the Integuments.

*Arteria Radialis.* 160. The radial Artery begins by detaching a ſmall Branch which runs upward like a Recurrent, toward the fold of the Arm, and turns backward round the external Condyle, communicating with the neighbouring Branches from the Trunk of the brachial Artery, eſpecially with the firſt collateral Branch on that ſide.

161. It runs down along the inſide of the Radius, between the Supinator Longus, Pronator Teres and the Integuments, giving Branches to theſe Muſcles, and likewiſe to the Perforatus, Perforans and Supinator Brevis. From thence it runs in a winding Courſe toward the Extremity of the Radius, ſupplying the Flexors of the Thumb and Pronator Quadratus.

162. Having reached the Extremity of the Radius, it runs nearer the Skin, eſpecially toward the anterior Edge of the Bone, being the Artery which we there feel when we examine the Pulſe.

163. At the end of the Radius, it gives off a Branch to the Thenar; and after having communicated with the Arch of the cubital Artery in the Palm of the Hand, and ſent off ſome cutaneous Branches at that place, it detaches one, along the whole internal lateral part of the Thumb.

164. Afterwards it runs between the firſt Phalanx and Tendons of the Thumb, to the Interſtice between the Baſis of this firſt Phalanx and of the firſt metacarpal Bone, where it turns toward the hollow of the Hand.

165. At this turning, it ſends off a Branch to the external lateral part of the Thumb, which having reached the end thereof, communicates by a ſmall Arch with the Branch which goes to the internal lateral Part.

166. It likewiſe ſends Branches outward, which run more or leſs tranſverſely between the firſt two Bones of the Metacarpus and the two Tendons of the Radialis Externus; and it communicates with an oppoſite Branch of the Cubitalis, together with which it furniſhes the external interoſſeous Muſcles and Integuments of the Back of the Hand and convex Side of the Carpus.

167. Lastly, the radial Artery terminates, in its Paſſage over the ſemi-interoſſeous Muſcle of the Index, near the Baſis of the firſt metacarpal Bone, and as it runs under the Tendons of the Flexor Muſcles of the Fingers, where it is joined to the Arch of the Cubitalis.

168. It ſends off another Branch which runs along the fore-part of the firſt Bone of the Metacarpus, to the convex Side of the Index, where it is loſt in the Integuments.

169. It gives likewiſe a Branch to the internal lateral part of the Index, which at the end of that Finger, joins an oppoſite Branch which comes from the Arch of the Cubitalis. It alſo ſends off a ſmall Branch croſs the internal interoſſeous Muſcles, where it forms a kind of ſmall irregular Arch, which communicates with the great Arch by ſeveral ſmall arterial Rami.

170. When the Arch of the Cubitalis ends at the middle Finger, the Radialis runs along the inner or concave part of the firſt metacarpal Bone, at the Head of which it terminates by two Branches.

171. One of theſe Branches runs along the inner and anterior lateral part of the Index; the other paſſes between the Flexor Tendons of this Finger and the metacarpal Bone, and having communicated with the cubital Branch of the middle Finger, it advances on the poſterior lateral part of the Index all the way to the end of that Finger, where it unites again with the firſt Branch.

*Arteria Diaphragmatica.*

172. The left Diaphragmatic Artery goes out commonly from the Aorta Deſcendens, as it paſſes between the Crura of the ſmall Muſcle of the Diaphragm. The right Diaphragmatic comes ſometimes from the neareſt Lumbar Artery, but moſt commonly from the Cæliaca. Sometimes both theſe Arteries ariſe by a ſmall common Trunk immediately from the Aorta. They likewiſe have the Name of Arteriæ Phrenicæ.

173. They appear almoſt always in ſeveral Ramifications on the concave or lower ſide of the Diaphragm, and ſeldom on the upper or convex ſide. They give ſmall Branches to the Glandulæ Renales or Capſulæ Atrabilariæ, which ſometimes communicate with the other Arteries that go to the ſame Part.

174. They ſend likewiſe ſmall Branches to the Fat which lies upon the Kidneys, called the Membrana Adipoſa, from whence they have the Name of Arteriæ Adipoſæ; and they ſometimes come immediately from the Trunk of the Aorta on one ſide of the Meſenterica Superior.

175. Besides theſe capital Diaphragmatic Arteries, there are others of a ſubordinate Claſs, which come from the Intercoſtales, Mammariæ Internæ, Mediaſtinæ, Pericardiæ and Cæliaca, as is obſerved in the Deſcription of each of theſe Arteries.

*Arteria Cæliaca.*

176. The Cæliac Artery ariſes anteriourly and a little to the left hand, from the Aorta Deſcendens, immediately after its paſſage through the ſmall Muſcle of the Diaphragm, nearly oppoſite to the Cartilage between the laſt Vertebra of the Back and firſt of the Loins. The Trunk of this Artery is very ſhort; and near its Origin, it ſends off from the right Side two ſmall Diaphragmaticæ, tho' ſometimes there is only one which goes to the right hand, and is afterwards diſtributed both ways; communicating with the other Arteries of the ſame name which come from the Intercoſtales and Mammariæ. The left Branch ſends Rami to the ſuperior Orifice of the Stomach and to the Glandula Renalis on the ſame ſide; the right furniſhes the Pylorus, and the Renal Gland on the right ſide.

177. Immediately after this, the Cæliaca gives off a conſiderable Branch, named Arteria Ventriculi Coronaria, and Gaſtrica, or Gaſtrica ſuperior; and then it preſently divides into two large Branches, one toward the right Hand, named Arteria Hepatica; the other to the left, called Splenica, which is larger than the former.

178. Sometimes this Artery is divided into theſe three Branches at the ſame place, very near its Origin; the Trunk going out from the Aorta almoſt in a ſtreight Line, and the Branches from the Trunk almoſt at Right Angles, like Radii from an Axis, whence this Trunk has been called Axis Arteriæ Cæliacæ.

*Arteria Ventriculi Coronaria.*

179. The Coronary Artery of the Stomach goes firſt to the left ſide of that Organ, a little beyond the ſuperiour Orifice; round which Orifice it throws Branches, and alſo to every part of the Stomach near it; and theſe Branches communicate with thoſe which run along the bottom of the Stomach to the Pylorus.

180. Afterwards it runs on the right ſide of the ſuperiour Orifice, along the ſmall Curvature of the Stomach, almoſt to the Pylorus, where it communicates with the Arteria Pylorica; and turning towards the ſmall Lobe of the Liver, it gives off ſome Branches to it.

181. Then it advances, under the Ductus Venoſus, to the left Lobe of the Liver, in which it loſes itſelf near the beginning of the juſt-mentioned Duct, having firſt given off ſome ſmall Branches to the neighbouring Parts of the Diaphragm and Omentum.

*Arteria Hepatica.*

182. As ſoon as the Hepatic Artery leaves the Cæliaca, it runs to the upper and inner part of the Pylorus, in company with the Vena Portæ, ſending off two Branches, a ſmall one called Arteria Pylorica, and a large one named Gaſtrica Dextra, or Gaſtrica Major.

183. The Pylorica is ramified on the Pylorus, from whence it has its Name; and having diſtributed Branches to the neighbouring parts of the Stomach, which communicate with thoſe of the right Gaſtrica, it terminates on the Pylorus, by an Anaſtomoſis with the Coronary Artery of the Stomach.

184. The right Gaſtric Artery having paſſed behind and beyond the Pylorus, ſends out a conſiderable Branch named Arteria Duodenalis, or Inteſtinalis, which ſometimes comes from the Trunk of the Hepatica, as we ſhall ſee hereafter. Afterwards this Gaſtric Artery runs along on the right ſide of the great Curvature of the Stomach, to the neighbouring parts of which, on both ſides, it diſtributes Branches.

185. These Branches communicate with thoſe of the Arteria Pylorica, and of the Coronaria Ventriculi, and with the right Gaſtro-Epiploicæ, which furniſh the neareſt Parts of the Omentum, and communicate with the Meſenterica Superior. After this, the right Gaſtric Artery ends in the left, which is a Branch of the Splenica.

186. The Duodenal or Inteſtinal Artery runs along the Duodenum on the ſide next the Pancreas; to both which it furniſhes Branches, and alſo to

the neighbouring part of the Stomach. Sometimes this Artery goes out from the Meſenterica Superior, and ſometimes it is double.

187. The Hepatic Artery having ſent out the Pylorica and right Gaſtrica, advances behind the Ductus Hepaticus, toward the Veſicula Fellis, to which it gives two principal Branches called Arteriæ Cyſticæ; and another named Bilaria, which is loſt in the great Lobe of the Liver.

188. Afterwards, this Artery enters the Fiſſure of the Liver, and joins the Vena Portæ, with which it runs within a membranous Vagina called Capſula Gliſſoni, and accompanies it through the whole Subſtance of the Liver by numerous Ramifications, which may be termed Arteriæ Hepaticæ Propriæ.

189. Before it enters the Liver, it gives ſmall Branches to the external Membrane of this Viſcus, and to the Capſula Gliſſoni. The Gaſtric and proper Hepatic Arteries come ſometimes from the Meſenterica Superior, when the ordinary Ramifications are wanting.

*Arteria Splenica.*

190. Immediately after the Origin of the Splenic Artery from the Cæliaca, it runs toward the left hand, under the Stomach and Pancreas, to the Spleen. It adheres cloſely to the poſterior part of the lower ſide of the Pancreas, to which it gives ſeveral Branches named Arteriæ Pancreaticæ.

191. Near the Extremity of the Pancreas, under the left Portion of the Stomach, the Splenic Artery gives off a principal Branch called Gaſtrica Siniſtra or Minor, which runs from left to right along the left Portion of the great Curvature of the Stomach, giving Branches to both ſides of this Portion, which communicate with thoſe of the Coronaria Ventriculi.

192. This Gaſtric Artery ſends likewiſe another Branch, at leaſt to the Extremity of the Pancreas, which communicates with the other Pancreatic Arteries. It alſo ſupplies the Omentum with Branches, termed Gaſtro-Epiploicæ Siniſtræ; and then it communicates with the right Gaſtrica, and from this Union, the Gaſtro-Epiploicæ Mediæ are produced.

193. From this Detail we learn that the Arteria Coronaria Ventriculi Pylorica, Inteſtinalis, both Gaſtricæ, Gaſtro-Epiploicæ, and conſequently the Hepatica, Splenica and Meſenterica, communicate all together.

194. Afterwards, the Splenic Artery advances towards the Spleen, in a courſe more or leſs contorted; but before it arrives at that Viſcus, it gives two or three Branches to the large Extremity of the Stomach, commonly called Vaſa Brevia; and one to the Omentum, named Epiploica.

195. At the Spleen, this Artery divides into four or five Branches, which enter that Viſcus, after having given ſome ſmall Twigs to the neighbouring Parts of the Stomach and Omentum.

*Arteria Meſenterica Superior.*

196. The ſuperiour Meſenteric Artery ariſes anteriourly from the lower Portion of the deſcending Aorta, a very little way below the Cæliaca, going out a little towards the right hand, but bending immediately afterwards to the left.

197. Near its Origin, it gives off a ſmall Branch, which dividing into two, goes to the lower ſide of the Head of the Pancreas, and neighbouring

part of the Duodenum, communicating with the Inteſtinalis by ſmall Arches, and Areolæ or Maſhes.

198. AFTERWARDS it paſſes over the Duodenum, between this Inteſtine and the Meſeraic Vein, between the two Laminæ of the Meſentery; and then bending in an oblique Direction from left to right, and from above downward, by very ſmall degrees, it advances toward the extremity of the Ileum. By this Incurvation, it forms a kind of long Arch, from the convex ſide of which a great many Branches go out.

199. THESE Branches are ſixteen or eighteen in number, or thereabouts, and almoſt all of them are beſtowed on the ſmall Inteſtines, from the lower third part of the Duodenum to the Cæcum and Colon. The firſt Branches are very ſhort, and from thence they increaſe gradually in length all the way to the middle of the Arch; the reſt diminiſhing again by ſmall degrees.

200. As they approach the Inteſtines, all theſe Branches communicate firſt by reciprocal Arches; then by Areolæ and Maſhes of all kinds of figures, from which is detached an infinite number of ſmall Ramifications, which ſurround the inteſtinal Canal, like an annular Piece of Net-work.

201. THESE Arches and Maſhes increaſe in number proportionably to the length of the Branches; and their Size diminiſhes gradually as they approach the Inteſtine.

202. THE firſt Branches from the Convex ſide of the Meſenteric Arch, which are very ſhort, ſupply the Pancreas and Meſocolon, and communicate with the Duodenal Artery. The laſt Branches go to the Appendicula Vermiformis, and ſend a Portion of an Arch to the beginning of the Colon.

203. THE conſiderable Branches from the concave ſide of the Meſenteric Arch, are ſeldom above two or three in number; but before they ariſe, a ſmall Ramus goes out to the Duodenum, and gives ſome very ſmall Arteries to the Pancreas.

204. THE firſt conſiderable Branch from the concave ſide of the Arch goes into the Meſocolon towards the right Portion of the Colon, being firſt divided into two Rami; the firſt of which runs along the whole ſuperior part of the Colon, where it forms the famous Communication with the Meſenterica Inferior; and might be named Arteria Colica Superior. The other Ramus of this Branch runs down on the right Portion of the Colon.

205. THE ſecond principal Branch having run for ſome ſpace through the Meſentery, divides into three Rami; the firſt of which goes to the lower part of the right Portion of the Colon, where it communicates with the ſecond Ramus of the firſt Branch; the ſecond goes to the beginning of the Colon, where it communicates with the firſt, and to the Inteſtinum Cæcum.

206. THE third Ramus of this ſecond Branch, having communicated with the ſecond, gives ſmall Twigs to the Cæcum, Appendicula Vermiformis, and Extremity of the Ileum. Afterwards it communicates with the Extremity of the Arch, or curve Trunk of the ſuperior Meſenteric.

207. All theſe Communications are by Arches and Maſhes, as in thoſe Branches that come from the convex ſide of the Arch; and it is to be obſerved in general, that all the Branches of the Meſenterica Superior are diſpoſed according to the Folds of the Meſentery and Circumvolutions of the Inteſtines; giving off Branches, through their whole courſe to the Laminæ of the Meſentery, its cellular Subſtance, and to the Meſenteric Glands.

*Arteria Meſenterica Inferior.*

208. The lower Meſenteric Artery goes out anteriourly from the Aorta Deſcendens Inferior, about a Finger's breadth or more above the Bifurcation, and below the ſpermatic Arteries; and having run about the length of an Inch, or ſomething more, it is divided into three or four Branches, which gradually ſeparate from each other.

209. The firſt or ſuperior Branch, about an Inch from its Origin, divides into two Rami; the firſt of which runs along the left Portion of the Colon, and forms the Communication of the two Meſenteric Arteries, already mentioned. It may be named Arteria Colica Siniſtra. The ſecond Ramus having communicated with the firſt, runs down upon the ſame Portion of the Colon.

210 The middle Branch having run the ſame length with the firſt, divides into two Rami; one of which paſſes upward on the extremity of the Colon, communicating by Arches with the ſecond Ramus of the ſuperiour Branch; the other runs down on the extremity of the ſame Inteſtine.

211. When there is another middle Branch, it goes to the firſt part of the double Curvature of the Colon, by a like Diſtribution and Communication from above downward.

212. The lower Branch goes to the ſecond Portion of the Colon, or to both, when the ſecond middle Branch is wanting, and ſends up a Ramus, which communicates with the foregoing.

213. It ſends another conſiderable Branch downward, called Arteria Hæmorrhoidalis Interna, which runs down behind the Inteſtinum Rectum, to which it is diſtributed by ſeveral Ramifications, and it communicates with the Arteriæ Hypogaſtricæ.

*Arteriæ Renales.*

214. The Renal Arteries, called commonly Emulgents, are ordinarily two in number, and go out laterally from the inferiour deſcending Aorta, immediately under the Meſenterica Superior, one to the right hand, the other to the left. The right is ſituated more backward, and is longer than the left, becauſe of the Vena Cava, which lies on the right ſide between the Aorta and the Kidney.

215. They run commonly without diviſion, and almoſt horizontally to the Kidneys, into the Depreſſions of which they enter by ſeveral Branches, which form Arches in the inner Subſtance of theſe Viſcera.

216. From theſe Arches, numerous ſmall Rami go out toward the Circumference or outer Surface of the Kidneys. Sometimes there is more than one Artery on each ſide; ſometimes this Augmentation is only on one ſide, and theſe ſupernumerary Arteries come ſometimes immediately from the Aorta, and enter at the upper or lower part of the Kidneys.

217. Ordinarily, the right Renal Artery paſſes behind the Vena Cava and Renal Vein on the other ſide; and the left Artery, firſt behind and then, before the Vein. Sometimes they ſend Branches to the Glandulæ Renale Membrana Adipoſa of the Kidneys, and even to the Diaphragm.

*Arteriæ Capſulares.* 218. The Arteries of the Renal Glands, which may be termed Arteriæ Capſulares, ariſe ſometimes from the Aorta above the Arteria Renalis, and give out the Arteriæ Adipoſæ, which go to the Fat of the Kidneys. Sometimes they come from the Trunk of the Cæliaca. The right Capſular Artery comes moſt commonly from the Arteria Renalis of the ſame ſide, near its Origin; the left, from the Aorta above the Renalis.

*Arteriæ Spermaticæ.* 219. The Spermatic Arteries are commonly two in number, ſometimes more. They are very ſmall, and go out anteriourly from the Aorta Deſcendens Inferior, near each other, about a Finger's breadth below the Arteriæ Renales, more or leſs, between the two Meſentericæ, or between the Renales and Meſentericæ Inferiores. Sometimes one is higher, or placed more laterally than the other.

220. They ſend off to the common Membrane of the Kidneys, ſmall Branches named Arteriæ Adipoſæ; and afterwards they run down upon the Pſoas Muſcles, on the foreſide the Ureters, between the two Laminæ of the Peritonæum.

221. They give ſeveral conſiderable Branches to the Peritonæum, chiefly to thoſe Parts of it which are next the Meſentery, and they communicate both with the Meſentericæ and Adipoſæ. They likewiſe ſend ſmall Arteries to the Ureters.

222. Afterwards, they paſs in Men through the Tendinous Openings of the Abdominal Muſcles in the Vagina of the Peritonæum, and are diſtributed to the Teſticles and Epididymes, where they communicate with a Branch of the Iliaca externa.

223. In Women they do not go out of the Abdomen, but are diſtributed to the Ovaria and Uterus, and communicate with Branches of the Hypogaſtrica, at the jagged Extremities of the Tubæ Falloppianæ.

*Arteriæ Lumbares.* 224. The Lumbar Arteries go out poſteriourly from the inferior deſcending Aorta, in five or ſix Pairs, or more, much in the ſame manner with the Intercoſtals.

225. They may be divided into Superiour and Inferiour. The Superiour ſend ſmall Branches to the neighbouring Parts of the Diaphragm and Intercoſtal Muſcles, and ſupply the place of Semi-intercoſtal Arteries. Sometimes thoſe Pairs go out by a ſmall common Trunk, and not ſeparately.

226. They are diſtributed on each ſide to the Pſoas Muſcles, to the Quadrati Lumborum, and to the oblique and tranſverſe Muſcles of the Abdomen; and by perforating the oblique Muſcles, they become external Hypogaſtric Arteries. They go likewiſe to the Vertebral Muſcles, and to the Bodies of the Vertebræ, and enter the Spinal Canal through the lateral Notches, to go to the Membranes, *&c.* forming Rings much in the ſame manner with the Intercoſtals; and they likewiſe give ſmall Twigs to the Nerves.

227. The Arteriæ Sacræ go out commonly from the back part of the inferiour deſcending Aorta, at the Bifurcation. Sometimes they ariſe higher, from the Lumbares, and ſometimes lower, from the Iliacæ. They are two, three or four in number, and ſometimes but one. They are ramified on the Os Sacrum, and on the neighbouring Parts of the Peritonæum, Inteſtinum Rectum, Fat, *&c.* and enter the Canal of that Bone through the anteriour Holes, being there diſtributed toward each ſide. They likewiſe ſend ſmall Arteries to the large Faſciculi of Nerves, which go out through the Holes of the Os Sacrum, and they penetrate the inner ſubſtance of that Bone. *Arteria Sacra.*

228. The inferiour deſcending Aorta ends at the laſt Vertebra of the Loins, and ſometimes higher, in two large lateral Branches, one on the right hand, the other on the left, called Arteriæ Iliacæ; each of which is a common Trunk to two other Arteries of the ſame name. This Bifurcation lies on the anteriour and left ſide of that of the Vena Cava. *Arteriæ Iliacæ.*

229. The primitive Iliac Arteries divaricate gradually as they deſcend, advancing obliquely toward the anteriour and lower part of the Oſſa Ilium, without any conſiderable Ramification for about the breadth of three Fingers, except a few very ſmall Arteries that go to the Os Sacrum, ſome of which enter by the upper Holes, and are diſtributed like the Arteriæ Sacræ, while others emerge again through the poſteriour Holes, and go to the neighbouring Muſcles, *&c.* They likewiſe give ſmall Arteries to the Peritonæum, to the Coats of the Veins, and to the Fat and Ureters, behind which the Iliac Trunks paſs.

230. The right Iliac Trunk paſſes firſt, on the foreſide of the Origin of the left Iliac Vein, and runs down on the foreſide of the right Vein, almoſt to the place where it goes out of the Abdomen, its courſe being there directed more inwardly. The left Trunk goes down likewiſe before the left Vein, but lies a little toward the inſide as it leaves the Abdomen.

231. About three Fingers breadth from their Origin, each Iliac Trunk is divided into two ſecondary Arteries, one external, the other internal. The external Artery has no particular name; the internal is termed Hypogaſtrica, which often appears to be no more than a Branch of the other, in Adults; but in young Children, and eſpecially in the Fœtus, the Hypogaſtric Artery looks like the Trunk, and the other like a Branch.

232. The external Iliaca on each ſide runs down on the Iliac Muſcle to the Ligamentum Falloppii, under which it goes out of the Abdomen. In this Courſe, it gives off only a few ſmall Arteries, to the Peritonæum and other Parts near it, but as it paſſes out of the Abdomen under the Ligament, it detaches two conſiderable Branches, one internal, the other external.

233. The internal Branch is named Arteria Epigaſtrica, and goes out anteriourly from the external Iliaca. From thence it runs obliquely upward on the Tendon of the tranſverſe Muſcle toward the poſteriour part of the Rectus, which it reaches about two or three Fingers breadth above the Os Pubis.

234. Afterwards the Epigaſtric Artery runs up along the poſteriour or inner ſide of this Muſcle, ſending Ramifications to the Tendons of the neigh-

bouring

bouring Muſcles, &c. and then loſes itſelf by a true Anaſtomoſis of ſeveral Ramifications, with the Mammaria interna. It likewiſe communicates with the inferiour Intercoſtals which are ſpread on the Abdomen.

235. It ſometimes gives out to particular Branches, one of which accompany'd by a Nerve, goes through the Foramen Ovale of the Pelvis to the Triceps Muſcles, &c. the other runs down to the Teſticles along with the ſpermatic Artery, and there communicates with it.

236. The external Branch of the outer Iliaca goes off laterally from the Outſide of that Artery under the Ligamentum Falloppii, and from thence to the internal Labium of the Os Ilium, where it divides into two, and is ramified on the oblique and tranſverſe Muſcles of the Abdomen communicating with the Arteria Lumbaris.

237. Besides theſe two Branches, the external Iliaca gives off a ſmall Ramus internally, under the Ligament, which runs to the Vagina of the ſpermatic Rope; and ſometimes another ſmall Twig goes from the Outſide, to the Os Ilium.

238. The internal Iliaca or Hypogaſtrica, having run a little more than a Finger's breadth inward and backward, bends by ſmall degrees obliquely forward, and toward the outſide; and afterwards contracting in its Dimenſions, it ends in the Umbilical Artery, which ought to be look'd upon as a true Continuation of the Trunk of the Hypogaſtrica.

239. This Arteria Umbilicalis aſcends on the ſide of the Bladder, and having detached ſmall Rami to that Viſcus and to the neighbouring Parts of the Peritonæum, &c. it contracts, and in Adults is quite cloſed up, above the middle of the Bladder. It likewiſe gives Branches to the Uterus, and to the neighbouring Parts in both Sexes. Afterwards it aſcends in form of a Ligament to the Umbilicus, where it joins the Umbilical Artery on the other ſide; its Name being taken from its uſe in the Fœtus.

240. From the convex ſide of the Curvature of the Hypogaſtric Artery, four or five principal Branches commonly go out very near each other. Sometimes they all ariſe ſeparately, ſometimes by ſmall common Trunks, and what is the firſt Branch in ſome Subjects, is only a Ramus of another principal Branch in others; ſo much does the Number, Diſpoſition, Origin, and Diſtribution of theſe Branches vary in different Subjects. For this reaſon I think it proper to diſtinguiſh them by the following proper Names; Iliaca minor, Glutæa, Sciatica, Pudica communis ſive Pudica Hypogaſtrica and Obturatrix.

241. The Iliaca minor, the moſt poſteriour of theſe Branches, and which is often no more than a Ramus of the Glutæa, paſſes between the laſt two Lumbar Nerves, and divides into two Rami, one of which enters the Canal of the Os Sacrum through the loweſt large anteriour Holes; the other paſſes behind the Muſculus Pſoas to which it gives Twigs, and behind the Crural Nerve, being afterwards diſtributed to the Iliac Muſcle, and to the middle part of the inſide of the Os Ilium, penetrating into the Subſtance of the Bone ſometimes by one Hole, ſometimes by more.

242. The Arteria Glutæa is commonly very conſiderable, and ſometimes the largeſt of all the Hypogaſtric Branches. Near its Beginning it ſometimes ſends out the Iliaca Minor, and ſometimes the ſmall Ramus that goes from that Artery to the Os Sacrum and other parts fixed to that Bone. Afterwards this Artery goes out of the Pelvis in company with the Sciatic Nerve, thro' the upper part of the great Sinus of the Os Innominatum, below the Muſculus Pyriformis, and is diſtributed in a radiated manner to the Glutæus Maximus and Medius.

243. In its paſſage, it gives ſome Branches to the Os Sacrum, Os Coccygis, Muſculus Pyriformis, the Muſcles of the Anus, and to the neighbouring parts of the Inteſtinum Rectum, forming a particular Hemorrhoidalis Interna. It likewiſe ſends Twigs to the Bladder and parts near it; and detaches a pretty long Branch which runs down with the Sciatic Nerve.

244. The Arteria Sciatica gives firſt of all, ſome Branches to the Muſculus Pyriformis, the Quadrigemini, the Os Sacrum, *&c.* and even to the inner ſide of the Os Iſchium. It likewiſe detaches a Branch which runs under the Muſculus Quadratus, to the Articulation of the Os Femoris.

245. It paſſes obliquely over the Sciatic Nerve, and as they both go through the great poſteriour Sinus of the Os Ilium, it detaches ſmall Arteries which are diſtributed to the inner Subſtance of that Nerve. Afterwards it runs up in a radiated manner on the outſide of the Os Ilium, and is diſtributed to the inner Subſtance of that Bone, and to the Muſculi Glutæi, eſpecially to the Medius and Minimus.

246. The Pudica Communis, called commonly Pudica Interna, ariſes ſometimes by a Trunk common to it and to the Glutæa, and gives out two principal Branches; the firſt of which paſſes through the great Sinus of the Os Ilium in company with the Glutæa and Sciatica, and then divides into two Rami.

247. The firſt Ramus goes behind the Spine of the Iſchium, between the two Ligaments which lie between that Bone and the Os Sacrum; and runs on the inſide of the Tuberculum Iſchii, all the way to the Origin of the Corpus Cavernoſum Penis. There it divides into ſeveral Arteries, one of which goes to the Sphincter Ani, under the Name of Hemorrhoidalis Externa.

248. The reſt are diſtributed to the neighbouring Integuments, to the Bulb of the Urethra, and to the Corpus Cavernoſum Penis; but the laſt of theſe Arteries, or rather the Extremity of this firſt Ramus, runs from behind forward, over the Neck of the Os Femoris, and communicates with a Branch of the Arteria Cruralis.

249. The ſecond principal Ramus called commonly Arteria Pudica Externa, runs between the Bladder and Inteſtinum Rectum, and is diſtributed in Men to the Veſiculæ Seminales, Neck of the Bladder, Proſtate Gland, and neighbouring parts of the Rectum.

250. Afterwards it runs under the Os Pubis on the ſide of a conſiderable Vein, which lies directly under the Symphyſis; and it runs along the Penis between this Vein and a Nerve, being diſtributed in its paſſage

to the Corpus Cavernoſum, and communicating with the Pudica Minor, which comes from the Cruralis.

251. This ſecond Branch of the Pudica Major goes off ſometimes ſeparately from the Hypogaſtrica, eſpecially in Women, being diſtributed to the lateral Parts of the Uterus, where it communicates with the ſpermatic Artery, near the jagged Extremity of the Tuba Falloppiana; and to the neighbouring parts of the Vagina, *&c.*

252. The Arteria Obturatrix perforates the Obturator Muſcles from whence it has its Name, and goes out of the Pelvis at the upper part of the Ligament of the Foramen Ovale, having firſt ſent a ſmall Branch over the Symphyſis of the Os Ilium and Os Pubis, to the Inguinal Glands and Integuments.

253. As it paſſes by the Muſcles, it divides and is diſtributed to the Pectineus and Triceps. It likewiſe ſends out another Branch, which communicates with that Branch of the Sciatica that goes to the Articulation of the Os Femoris; and gives ſmall Arteries to the Holes in the Neck of that Bone.

254. Afterwards the Hypogaſtric Artery ends in the Umbilicalis, as has been already ſaid.

*Arteriæ Crurales.* 255. The Iliac Artery goes out of the Abdomen between the Ligamentum Falloppii and Tendon of the Pſoas at the Union of the Os Ilium and Os Pubis, and there it takes the Name of Arteria Cruralis.

256. It ſends off firſt of all, three ſmall Branches; one of which called Pudica Externa, goes over the Crural Vein to the Skin and Ligament of the Penis and to the Inguinal Glands, communicating with the Pudica Interna. The ſecond goes to the Muſculus Pectineus; and the third to the upper part of the Sartorius. All theſe Branches furniſh likewiſe the neighbouring anteriour Integuments.

257. Afterwards the Crural Artery runs down on the Head of the Os Femoris, and by taking a particular turn, gets on the inſide of the Crural Vein, about three Fingers breadth from where it goes out of the Abdomen. From its Origin to this place, it is covered only by the Skin and Fat, and lies on the Pectineus and Triceps Primus.

258. In changing its Situation it ſends out three conſiderable Branches, one external, one middle, and one internal. They all go out more or leſs poſteriourly, ſometimes by a ſhort common Trunk, ſometimes by two, *&c.*

259. The external Branch runs on the upper ſide of the Thigh to the Crureus, Vaſtus Externus, Rectus Anterior, Muſculus Faſciæ Latæ and Glutæus Medius; ſending up a Ramus to the Apex of the great Trochanter, which communicates with the firſt principal Ramus of the Pudica Major, and Sciatica, as has been already ſaid.

260. The middle Branch runs down on the inſide of the Thigh betweeen the Triceps Muſcles, to which it gives ſeveral Rami, one whereof perforates the ſecond Muſcle, and is diſtributed to the Glutæus Maximus, Semi-Nervoſus, Semi-Membranoſus, Biceps, and to the neighbouring Integuments.

261. The internal Branch runs backward on the Quadrigemini towards the great Trochanter; and having detached a Ramus which goes into the Joint of the Os Femoris, it runs downward and gives Rami to all the Muſcles that lie on the backſide of that Bone, one of which enters the Bone itſelf on one ſide of the Linea Aſpera.

262. Having ſent off all theſe three Branches, the Arteria Cruralis runs down between the Sartorius, Vaſtus Internus and Triceps, giving Branches to all the parts near it. It is covered by the Sartorius all the way to the lower part of the Thigh, where it is inflected backward over the Triceps Tertius a little above the internal Condyle of the Os Femoris. Afterwards continuing its Courſe through the hollow of the Ham, it is called Arteria Poplitea, being accompany'd by the Vein of the ſame name.

263. The Poplitea while in the Ham, is covered only by the Integument, ſending off Branches toward each ſide, which run up upon the Condyles, and communicate with the lower Ramifications of the Arteria Cruralis.

264. It ſends Rami to the Joint of the Knee, one of which at leaſt paſſes between the Crucial Ligaments. As it runs down it ſends Branches to the Gaſtrocnemii and Popliteus; and having reached the backſide of the Head of the Tibia, it gives off two Branches, one to each ſide.

265. The firſt or internal Branch ſurrounds the forepart of the Head of the Tibia, paſſing between the Bone and internal lateral Ligament; and beſides ſeveral other Ramifications, ſends up a ſmall Branch which communicates with the Arteries that lie round the Condyles of the Os Femoris.

266. The ſecond or external Branch runs over the Head of the Fibula, and between the Head of the Tibia and external lateral Ligament of the Knee, ſurrounding the Articulation all the way to the Ligament of the Patella, and communicating with the Branches which lie round the Condyles of the Os Femoris, together with a Branch of the firſt or internal Ramus.

267. Immediately after the Origin of theſe two Rami, and before the Poplitea ends, it ſends a ſmall Artery down on the backſide of the interoſſeous Ligament, very near the Tibia, into which it enters by a particular Hole a little above the middle portion of the Bone.

268. As the Poplitea ends, it divides into two principal Branches, one of which runs between the heads of the Tibia and Fibula, paſſing from behind forwards on the interoſſeous Ligament, where it takes the name of Arteria Tibialis Anterior. The ſecond Branch divides into two others, one internal and largeſt, called Arteria Tibialis Poſterior, the other poſteriour and ſmalleſt, named Arteria Peronæa Poſterior.

269. The Tibialis Anterior having paſſed between the heads of the Tibia and Fibula, ſends ſmall Branches upward and laterally. The ſuperior Branches communicate with thoſe Rami of the Popliteus which lie round the Articulation; and the lateral Branches go to the neighbouring parts. Afterwards this Tibial Artery runs down on the foreſide of the interoſſeous Ligament, toward the outſide of the Tibia, between the Muſculus Tibialis Anticus and Extenſor Pollicis.

270. Having run laterally on the Tibia for about two thirds of the length of that Bone, it paſſes on the fore ſide under the common Annular Ligament, and Extenſor Pollicis, to the Articulation of the Foot; giving off ſeveral Rami both to the right and left hand, which communicate laterally with the Tibialis Poſterior and Peronæa Poſterior, ſo that theſe two Bones are in a manner ſurrounded by Arteries.

271. At the Joint of the Foot, it ſends out Branches which run between the Aſtragalus and Os Calcis, being diſtributed to the Articulation and to the Bones of the Tarſus. The Communications are here very numerous on all ſides.

272. Having paſſed the Fold of the Foot, it ſends off toward both ſides, other Rami, which communicate with the Poſterior Tibialis and Peronæa; all theſe Branches making a kind of Circles round the Tarſus.

273. Afterwards the anteriour Tibial Artery advances on the convex ſide of the Foot, as far as the Interſtice between the firſt and ſecond Metatarſal Bones; between the Heads of which, it ſends a large Branch, which perforates the ſuperiour interoſſeous Muſcles, and joining the Tibialis Poſterior, forms an Arch on the ſide of the Foot.

274. It likewiſe ſends two or three conſiderable Branches, over the other Metatarſal Bones, which go to the reſt of the interoſſeous Muſcles, Integuments, *&c.* and communicate with each other.

275. Lastly, this Artery terminates by two principal Branches, one of which goes to the Thenar and Inſide of the Great Toe; the other is ſpent upon the Outſide of the Great Toe, and the Inſide of the ſecond Toe.

176. The Tibialis Poſterior, called likewiſe Suralis, runs down between the Solei, Tibialis Poſticus, Flexor Digitorum communis, and Flexor Pollicis; giving Branches to theſe Muſcles, to the Tibia, and to the Marrow of that Bone, through a particular Canal in its poſteriour and upper Part.

277. Afterwards it runs behind the inner Ankle, communicating with the Tibialis Anterior, and ſurrounded by the neighbouring Veins; and paſſes to the Sole of the Foot between the concave ſide of the Os Calcis and Thenar Muſcle, where it divides into two Branches, one large or external, the other ſmall or internal.

278. The great Branch, or Arteria Plantaris externa, paſſes on the concave ſide of the Os Calcis obliquely under the Sole of the Foot, to the Baſis of the fifth Metatarſal Bone, and from thence runs in a kind of Arch toward the Great Toe, communicating there with the Tibialis Anterior, which perforates the interoſſeous Muſcles in the manner already ſaid.

279. The convex ſide of this Arch ſupplies both ſides of the laſt three Toes, and the outſide of the ſecond Toe, forming ſmall communicating Arches at the end, and ſometimes at the middle of each Toe, as in the Hand. The concave ſide of the Arch furniſhes the neighbouring Parts.

280. The ſmall Branch, or Anteria Plantaris Interna, having reached beyond the middle of the Sole of the Foot, is divided into two; one of which goes to the great Toe, communicating with the Ramus of the Tibialis Anterior;

terior; the other is diſtributed to the firſt Phalanges of the other Toes, communicating with the Ramifications from the Arch already mentioned.

281. The Arteria Peronæa runs down on the backſide of the Fibula, between the Soleus and Flexor Pollicis, to which and to the neighbouring Parts it gives Rami in its paſſage.

282. Having reached to the lower third part of the Fibula, it ſends off a conſiderable Branch, which runs in between the Tibia and that Bone paſſing between their Extremities from behind forward, below the interoſſeous Ligament, and is diſtributed to the Integuments of the Tarſus.

283. Lastly, the Peronæa continuing its courſe downward, on the backſide of the Fibula, as far as the Os Calcis, forms an Arch with the Tibialis Poſterior, between the Aſtragalus and the Tendo Achillis.

284. From thence it runs outward, and a little above the outer Ankle communicates with the Tibialis Anterior by an Arch, which ſends ſeveral ſmall Ramifications to the neighbouring Parts.

285. In this Deſcription of the Arteries, I have ſaid nothing of the Cutaneous Anaſtomoſes, which are exceedingly beautiful in the Fœtus; nor of the frequent and conſiderable Communications of ſmall Arteries upon the Perioſteum, which form a delicate kind of Net-work, or Rete Mirabile.

## SECT. V.

## *A Deſcription of the Veins.*

*Introduction.* 1. THE Blood diſtributed to all Parts of the Body by two kinds of Arteries, the Aorta and Arteria Pulmonaris, returns by three kinds of Veins, called by Anatomiſts Vena Cava, Vena Portæ, and Vena Pulmonaris.

2. The Vena Cava carries back to the right Auricle of the Heart, the Blood conveyed by the Aorta to all the Parts of the Body, except what goes by the Arteriæ Coronariæ Cordis. It receives all this Blood from the Arterial Ramifications in part directly, and in part indirectly.

3. The Vena Portæ receives the Blood carried to the floating Viſcera of the Abdomen by the Arteria Cæliaca, and the two Meſentericæ, and conveys it to the Vena Hepatica, and from thence to the Vena Cava.

4. The Vena Pulmonaris conveys to the Pulmonary Sinus, or left Auricle of the Heart, the Blood carried to the Lungs by the Arteria Pulmonaris.

5. To theſe three Veins two others might be added, *viz.* thoſe which belong particularly to the Heart and to its Auricles, and the Sinuſes of the Dura Mater.

6. In deſcribing the general Courſe of the Veins, we may either begin by their Extremities in all the parts of the Body, and end by the Trunks carried all the way to the Heart, according to the Courſe of the Blood ; or we may begin by the great Trunks, and end by the Ramifications and capillary Extremities, according to their ſeveral Diviſions and Subdiviſions.

7. This laſt Method is moſt convenient, and makes it a very eaſy matter to purſue the firſt, whenever we think it proper to do it ; and for theſe Reaſons, I have choſen to follow it in this Deſcription.

*General Diviſion of the Vena Cava.* 8. We commonly talk of the Vena Cava in general, as if it were but one Vein at its Origin, or had but one common Trunk ; whereas it goes out from the right Auricle of the Heart by two large ſeparate Trunks, in a Direction almoſt perpendicularly oppoſite to each other, one running upward called Vena Cava Superior, the other downward called Vena Cava Inferior.

9. It may however be ſaid, that theſe two Veins have a ſort of Continuity, or a ſmall Portion of a common Trunk, fixed to the Edges of the right Auricle ; as if three quarters of the Circumference of a large ſtreight Tube were cut off, and the Edges of a ſmall Bladder applied to the Edges of the Opening thus made in the Tube.

10. The right Auricle may alſo be look'd upon as a Muſcular Trunk common to theſe two large Veins, and may be called the Sinus of the Vena Cava ; but in this reſpect, the name of Sinus Pulmonaris agrees ſtill better to the left Auricle.

11. The Vena Cava Superior is diſtributed chiefly to the Thorax, Head, and upper Extremities, and but very little to the Parts below the Diaphragm.

12. The Vena Cava Inferior is diſtributed chiefly to the Abdomen and lower Extremities, and but very little to the Parts above the Diaphragm.

13. The Ancients called the Superior Vena Cava, Aſcendens, and the Inferior, Deſcendens, having regard only to the great Tubes, and to their Diviſion into Trunks and Branches. Several Moderns have retained theſe Names, but in a contrary Signification, to accommodate them to the Motion of the Blood, which deſcends by the Cava Superior, and aſcends by the Cava Inferior.

14. But to ſhun the Miſtakes that may happen in Reports made of Wounds or other Diſeaſes, and of what is obſerved in Opening dead Bodies, and in other Caſes of theſe kinds, it is beſt to retain the Diſtinction of Vena Cava Superior and Inferior.

15. The Trunk of each of theſe two Veins ſends off, much in the ſame manner with the Arteries, a certain Number of principal or capital Branches, which are afterward ramified in different manners. Each Trunk terminates afterwards by a Bifurcation or a Diviſion into two ſubordinate Trunks, each of which gives off other principal Branches, ending in a great number of ſmall Trunks, Rami and Ramifications.

16. They have likewiſe this common to them with the Arteries, that the greateſt part of the capital Branches are in Pairs; as well as the ſubordinate Trunks. The Ramifications of each ſubaltern Trunk taken by itſelf, are in uneven Numbers, but they make even Numbers with thoſe of the other like Trunk. The Vena Azygos and ſome other ſmall Veins, of which hereafter, are Exceptions from this Rule.

17. Before I go on to the particular Deſcription of each of theſe Veins, many of which have proper Names, I ſhall give a general Idea of their Diſtribution, and an Enumeration of their principal Ramifications, in the ſame manner as I did in the Deſcription of the Arteries, and for the ſame Reaſon. But I ſhall ſay nothing of the Venæ Coronariæ Cordis, becauſe they are not immediately join'd to any other Vein, as we ſhall ſee in deſcribing the Parts of the Thorax. I begin by the Vena Cava Superior.

*Vena Cava Superior.*

18. The Superior Vena Cava runs up from the right Auricle of the Heart, almoſt in a direct Courſe, for about two Fingers breadth, lying within the Pericardium, in the right ſide of the Trunk of the Aorta, but a little more anteriourly.

19. As it goes out of the Pericardium, it is inclined a little to the left Hand, and then runs up about an Inch, that is, as high as the Cartilage of the firſt true Rib, and a little higher than the Curvature of the Aorta. At this Place it terminates by a Bifurcation or Diviſion into two large Branches or ſubordinate Trunks, one of which runs toward the left hand, the other toward the right.

20. These two Branches are named Subclaviæ, as lying behind, and in ſome meaſure, under the Claviculæ, both in the ſame manner. They

are of unequal lengths, becauſe the Trunk of the Vena Cava does not lie in the middle of the Thorax, but toward the right Side, where the left Subclavian ariſes as well as the right, and is conſequently longeſt.

21. The Trunk of the Superior Cava from where it leaves the Pericardium to the Bifurcation, ſends out anteriourly ſeveral ſmall Branches, which ſometimes ariſe ſeparately and ſometimes by ſmall common Trunks. Theſe Branches are the Vena Mediaſtina, Pericardia, Diaphragmatica Superior, Thymica, Mammaria Interna, and Trachealis, the laſt of which go out ſometimes behind the Bifurcation.

22. All theſe ſmall Branches from the Trunk of the Cava Superior are termed Dextræ; and their Fellows on the other ſide called Siniſtræ do not ariſe from the Trunk, becauſe of its lateral Situation, but from the left Subclavia.

23. Posteriourly, a little above the Pericardium, the Trunk of the Superior Cava ſends out a capital Branch, called Vena Azygos, or Vena ſine Pari, which runs down on the right Side of the Bodies of the Vertebræ Dorſi, almoſt to the Diaphragm; giving off the greateſt part of the Venæ Intercoſtales and Lumbares Superiores.

24. The two Subclaviæ run laterally or toward each ſide, and terminate as they go out of the Thorax, between the firſt Rib and Clavicula, immediately before the anteriour Inſertion of the Muſculus Scalenus.

25. The right Subclavian, which is the ſhorteſt of the two, commonly ſends out four capital Branches; the Jugularis Externa, Jugularis Interna, Vertebralis and Axillaris, which laſt is rather a Continuation than a Branch of the Subclavia.

26. The left Subclavian being longer than the right, for the reaſon already given, gives off firſt of all the ſmall Veins on the left ſide, anſwering thoſe on the right ſide that come from the Trunk of the Superior Cava, *viz.* the Mediaſtina, Pericardia, Diaphragmatica Superior, Thymica, Mammaria Interna and Trachealis.

27. Next to theſe ſmall Veins, called Siniſtræ, it detaches another ſmall Branch, called Intercoſtalis Superior Siniſtra, and then four large Branches like thoſe from the right Subclavian, *viz.* the Jugularis Externa, Jugularis Interna, Vertebralis and Axillaris, which are all termed Siniſtræ.

28. The external jugular Veins are diſtributed chiefly to the outer parts of the Throat, Neck and Head; and ſend a ſmall Vein to the Arm, named Cephalica, which aſſiſts in forming a large one of the ſame Name.

29. The internal jugular Veins go to the internal parts of the Neck and Head, communicating with the Sinuſes of the Dura Mater, and in ſeveral places, with the external jugular Veins.

30. The vertebral Veins paſs thro' the Holes in the tranſverſe Apophyſes of the Vertebræ of the Neck, ſending Branches to the Neck and Occiput. They form the Sinus Venales of theſe Vertebræ, and communicate with the Sinuſes of the Dura Mater.

31. The Axillary Veins are Continuations of the Subclaviæ, from where theſe leave the Thorax, to the Axillæ. They produce the Mammariæ Internæ,

ternæ, Thoracicæ, Scapulares or Humerales, and a Branch to each Arm, which, together with that from the external Jugularis, forms the Vena Cephalica.

32. Afterwards the Axillary Vein terminates in the principal Vein of the Arm, called Baſilica; which, together with the Cephalica, is diſtributed by numerous Ramifications to all the parts of the Arm, Fore-Arm and Hand.

*Vena Cava Inferior.*

33. The Portion of the inferior Vena Cava contained in the Pericardium is very ſmall, being ſcarcely the twelfth part of an Inch on the forepart, and not above a quarter of an Inch on the back part. From thence it immediately perforates the Diaphragm, to which it gives the Venæ Diaphragmaticæ Inferiores or Phrenicæ.

34. It paſſes next behind the Liver, through the great Sinus of that Viſcus to which it furniſhes ſeveral Branches, termed Venæ Hepaticæ.

35. In this Courſe it inclines a little toward the Spina Dorſi and Aorta Inferior, the Trunk and Ramifications of which it afterwards accompanies in the Abdomen, all the way to the Os Sacrum; the Arteria Cæliaca and the two Meſentericæ only excepted.

36. Thus the inferior Cava ſends out on each ſide, in the ſame manner with the Aorta, the Venæ Adipoſæ, Renales, Spermaticæ, Lumbares, and Sacræ. Having reached to the Os Sacrum it loſes the Name of Cava, and terminating by a Bifurcation, like that of the deſcending Aorta, it forms the two Venæ Iliacæ.

37. These Iliac Veins having given off the Hypogaſtricæ with all their Ramifications, to the Viſcera of the Pelvis and to ſome other external and internal neighbouring Parts, go out of the Abdomen, under the Ligamentum Falloppii, and there take the Name of Venæ Crurales.

38. Each Crural Vein ſends off numerous Ramifications to all the lower Extremity; beſides the Vena Saphena which goes out near the Origin of the Cruralis, and running along this whole Extremity, detaches many Ramifications, all the way to the Foot, as we ſhall ſee more particularly hereafter.

*Vena Azygos and Venæ Intercoſtales.*

39. The Vena Azygos or ſine Pari is very conſiderable, and ariſes poſteriourly from the Superior Cava a little above the Pericardium.

40. It is immediately afterwards bent backward over the Origin of the right Lung; forming an Arch which ſurrounds the great Pulmonary Veſſels on that ſide, as the Arch of the Aorta does thoſe of the left Side, with this difference only, that the Curvature of the Azygos is almoſt directly backward, whereas that of the Aorta is oblique.

41. From thence it runs down on the right ſide Vertebræ Dorſi on one ſide of the Aorta, and before the Intercoſtal Arteries; and getting behind the Diaphragm, it terminates by a very ſenſible Anaſtomoſis, ſometimes with the Vena Renalis, ſometimes with a neighbouring Lumbar Vein, ſometimes immediately with the Trunk of the Cava Inferior, and ſometimes otherwiſe.

42. I have ſeen this Vein extremely large, reſembling the Trunk of the inferior Cava, from the Diaphragm, to the Origin of the Renales; the

true Cava being through all this Space very narrow, or of the ſize of an ordinary Azygos.

43. THE Vena Azygos ſends out firſt of all, two or three ſmall Veins from the Top of the Arch, one of which goes to the Aſpera Arteria; the others partly to the Aſpera Arteria, and partly to the Bronchia, by the name of Venæ Bronchiales, accompanying the Ramifications of the Bronchial Artery.

44. AFTERWARDS the Azygos detaches from the Extremity of the Arch a ſmall Trunk common to two or three ſmall Veins, called Intercoſtales ſuperiores Dextræ, which bring back the Blood from the firſt three Series of intercoſtal Muſcles, and from the neighbouring Part of the Pleura.

45. THESE intercoſtal Veins ſend Branches through the intercoſtal Muſcles to the Serratus ſuperior Poſticus, Serratus major, *&c.* and afterwards they run along the Interſtices between the Ribs, communicating with the Venæ Mammariæ.

46. THEY likewiſe ſend ſmall Branches backward to the Vertebral Muſcles, and Canal of the Spine, where they communicate with the Venal Circles, or Sinuſes which bring back the Blood from the Medulla Spinalis.

47. As the Azygos runs down, it ſends off the inferiour intercoſtal Veins on the right ſide, one going to each Series of intercoſtal Muſcles. Theſe Veins run along the lower Edges of the Ribs, and perforate the Muſcles by Branches, which go to the poſteriour and external Part of the Thorax.

48. THEY communicate with the Venæ Thoracicæ, and moſt commonly with the Mammaria Interna; and laſtly, more or leſs with each other, by perpendicular Branches, near the poſteriour Extremities of the Ribs.

49. THE Azygos ſends off likewiſe the left intercoſtal Veins, but ſeldom the whole number; for the ſuperiour Veins come often from the left Subclavian, as we ſhall ſee in the Hiſtory of that Vein. The inferiour intercoſtal Veins, to the number of ſix or ſeven, ſometimes more, ſometimes fewer, come often from the Trunk of the Azygos; and running between the Aorta and Vertebræ, to the Subſtance of which they give ſmall capillary Twigs, they ſend off almoſt the ſame Ramifications with the Veins on the right ſide, and likewiſe ſome to the Œſophagus.

50. SOMETIMES theſe intercoſtal Veins come from a ſmall common Trunk which goes out from that of the Azygos, and paſſing between the Aorta and Vertebræ is bent downward along the left ſide of the Vertebræ, in which Courſe, it detaches the Intercoſtals laterally. This ſmall Trunk is in ſome Subjects bifurcated upward and downward, as it ſends off the Intercoſtals; and in others there are two ſmall common Trunks.

51. LASTLY, there is ſometimes an intire Azygos on the left ſide, which proceeding from the Arch of the ordinary Azygos, is afterwards diſtributed in the ſame manner as the other on the right ſide; but this Diſpoſition likewiſe varies very much.

52. THE Azygos having reached below the laſt Rib, ſends off a large Branch, which bending outward, perforates the Muſcles of the Abdomen, is ramified between their different Planes, and communicates with the like Ramifications of the laſt, or laſt two intercoſtal Veins.

53. Sometimes it ſends off the Vena Diaphragmatica inferior, and likewiſe gives downward to the firſt, or firſt two tranſverſe Apophyſes of the Vertebræ Lumbares, a Branch which forms the firſt Venæ Lumbares Dextræ.

54. These Communications between the laſt Intercoſtal, and firſt Lumbar Veins are very irregular, being ſometimes by a Series of oppoſite Angles, ſometimes by Areolæ, ſometimes by a reticular Texture, *&c.* Sometimes the Extremity of the Vena Azygos communicates either mediately or immediately with the Vena Adipoſa, and even with the Vena Spermatica.

*Venæ Pectorales Internæ.*

55. The Pectorales internæ, are ſmall Veins diſpoſed in Pairs toward the right and left hand, behind the Sternum and parts near it, including the Diaphragmaticæ Superiores, or Pericardio Diaphragmaticæ, Mediaſtinæ, Mammariæ internæ, Thymicæ, Pericardiæ, and Gutturales or Tracheales.

56. All theſe ſmall Veins are divided into right and left; and theſe are both diſtributed much in the ſame manner; but they differ in their Origins, becauſe of the Inequality in the Bifurcation of the Cava ſuperior.

57. The right Vena Mediaſtina goes out anteriourly from the Trunk of the ſuperior Cava, a little above the Origin of the Azygos; the left comes from the Subclavia.

58. The right ſuperior Diaphragmatica or Pericardio-Diaphragmatica comes anteriourly from the Root of the Bifurcation near the Mediaſtina; and is diſtributed by ſeveral Branches to the upper, fore, and back Parts of the Pericardium, communicating with thoſe of the left Diaphragmatica, and accompanying the Nerve of the ſame name. The left ſuperiour Diaphragmatica comes from the left Subclavian a little below the Origin of the Mammaria.

59. The right internal Mammaria ariſes anteriourly from the Vena Cava, a little below the Angle of the Bifurcation. It runs along the neareſt internal or poſteriour Edge of the Sternum, and on the cartilaginous Extremities of the right Ribs, together with the Artery of the ſame name. Having reached near the Diaphragm, it ſends it a Branch which runs toward the tendinous Plane, and communicates with the common diaphargmatic Veins.

60. Afterwards this mammary Vein gives ſmall Branches to the Mediaſtinum, and others between the Ribs to the Integuments; of which thoſe that paſs between and under the Cartilages of the laſt true Ribs, run down on the inner or poſteriour ſide of the Muſculi Recti Abdominis, being ramified among their fleſhy Fibres, and communicating really with the Epigaſtric Veins by ſeveral ſmall Twigs.

61. The left internal Mammaria ariſes anteriourly from the left Subclavian, oppoſite to the Cartilage or anteriour Extremity of the firſt true Rib.

62. The right Vena Thymica, when it ariſes ſeparately, goes out from the Bifurcation; and when it is wanting, the Thymus from whence it takes its name, is furniſhed by the Gutturalis or ſome other neighbouring Vein. This Vein often reaches no lower than the inferiour part of the Thymus; and the left Vein of the ſame name comes from the left Subclavian, almoſt oppoſite to the Sternum.

63. The right Pericardia ſeems to go out rather from the Origin of the right Subclavian, than from the Trunk of the ſuperior Cava; but in this

there are many Varieties. It goes to the upper ſide of the Pericardium, and other neighbouring Parts. The left Pericardia comes ſometimes from the left Subclavian, before the Mammaria, and ſometimes from the Mammaria or Diaphragmatica ſuperior on the ſame ſide.

64. The right Gutturalis or Trachealis goes out from the upper part of the Bifurcation, above the Mammaria of the ſame ſide, ſometimes more backward, and ſometimes from the Subclavia. It is diſtributed to the Glandulæ Thyroidææ, Trachea Arteria, Muſculi Sterno-Hyoidæi, Thymus and Glandulæ Bronchiales. It communicates by lateral Branches more or leſs contorted, with the internal jugular Vein, and ſometimes by another Branch, with a ſmall Vein, which the internal Jugular ſends to the Glandula Thyroides. The left Gutturalis comes from the upper or poſterior Part of the left Subclavian near its Origin.

65. The ſmalleſt internal pectoral Veins do not always ariſe ſeparately, but have ſometimes a ſmall common Trunk, eſpecially on the right ſide; and of all theſe ſmall Veins, the Mammaria interna is the moſt conſiderable.

*Venæ Subclaviæ.*

66. The right ſubclavian Vein, as has been already ſaid, is very ſhort, and its Courſe very oblique, ſo that it appears to riſe higher than the left Vein. It ſends off firſt of all, four large Branches already mentioned, *viz.* the Vertebralis, which is the firſt and moſt poſteriour; the Jugularis interna, Jugularis externa and Axillaris.

67. The left Subclavian ſeems to aſcend but very little, after the Bifurcation, becauſe it runs further and more tranſverſely than the right; and in this Courſe it covers the Origin of three large Arteries, which come from the Curvature of the Aorta. It ſends off four large Branches beſides the ſmall pectoral Veins, and receives the Ductus Thoracicus.

68. It likewiſe gives off, before its principal Diviſion, a ſmall Trunk for the left ſuperiour Intercoſtals, which are ſometimes ſix in number, and communicate with the inferiour Intercoſtals, and with a Branch of the Vena Azygos. This ſmall common intercoſtal Trunk furniſhes likewiſe the left Bronchialis.

69. Each Subclavian Vein near the middle of the Clavicula, ſends off a Branch call'd Cephalica, which deſcends near the Surface of the Body, between the Deltoides and Pectoralis Major, and reaches the Arm in the manner which ſhall be related hereafter.

*Venæ Jugulares Externæ.*

70. Each external jugular Vein ariſes from the Subclavian on the ſame ſide, ſometimes from the Axillaris, and ſometimes from the Union of theſe two Veins. The right and left do not always ariſe in the ſame manner; for ſometimes the right comes from the Subclavian, and the left from the internal Jugular on the ſame ſide. They run up between the Muſculus Cutaneus and Sterno-Maſtoidæus, being covered by the former, and croſſing over the latter.

71. Sometimes they are double from their very Origins; and when they are ſingle, each of them divides afterwards into two, one anteriour, and the other poſteriour or rather ſuperiour. The anteriour Vein goes to the Throat and Face, running up toward the Angle of the lower Jaw, and the poſteriour goes to the Temples and Occiput.

*Vena Jugularis Externa Anterior.*

72. The anteriour external jugular Vein is often a Branch of the Jugularis interna, and ſometimes ariſes from the Communications of the two Jugulares in ſuch a manner as that it cannot be ſaid to belong more to the one than to the other. Sometimes, but very rarely, it comes from the Vena Axillaris.

73. It runs up toward the lateral Part of the lower Jaw, between the Angle and the Chin, like a Vena Maxillaris, and ſends ſeveral Branches forwards, backwards and inwards.

74. Posteriourly it gives, (1) a large Branch on the ſide of the upper Part of the Larynx, which communicates with the Jugularis interna; and likewiſe with a large ſhort Branch of the Jugularis externa poſterior, of which below. (2) A ſmall Branch which has the ſame Communication, but which is not always to be found. (3) Another ſmall Branch a little below the lower Jaw, which communicates with the Jugularis externa poſterior.

75. Anteriourly it ſends ſeveral Branches to the Muſcles of the Larynx, Sterno-Hyoidæi, Thyro-Hyoidæi and to the Integuments; and below the Larynx it ſends communicating Branches to the Jugularis externa Anterior of the other ſide.

76. A little higher, oppoſite to the Cartilago Thyroides, it gives off a tranſverſe Branch, which runs on the anteriour and lower Part of the Muſculi Sterno-Maſtoidæi, and communicates with the Jugularis of the other ſide, tho' not always by a Vein of the ſame kind.

77. The ſuperiour and inferiour tranſverſe Branches communicate on each ſide by Branches more or leſs perpendicular, and ſend a ſmall Branch to the Muſculus Quadratus of the Chin, to the Muſculus Cutaneus and Integuments.

78. It ſends another large Branch anteriourly toward the Symphyſis of the lower Jaw, which after having ſupplied the maxillary Glands, is diſtributed to the Digaſtric Muſcle, to the Chin and under Lip.

79. Interiourly at the ſame place it ſends out a large Branch, which furniſhes the Glandulæ Sublinguales, runs down toward the Cornua of the Os Hyoides, to communicate with ſome Branches of the Jugularis interna, and ſends ſeveral Rami to the Tongue, called Venæ Raninæ. It gives off likewiſe a ſmall Branch, which running upon the Muſculus Labiorum Triangularis, to the Commiſſure of the Lips, is diſtributed to the neighbouring Parts.

80. The ſame Branch which gives out the Venæ Raninæ, detaches another to the lateral Parts of the Septum Palati, which is diſtributed to the Amygdalæ, and to the Uvula, and ſends Rami forward to the Membrane, which lines the Arch of the Palate. Another Branch goes out from it to the Pterygoidæus internus, Periſtaphylini and Cephalo-Pharyngæi.

81. Afterwards the Trunk of the anteriour external jugular Vein runs up on the Muſculus Triangularis, where it receives the Name of Vena Triangularis, in a winding Courſe from the Angle of the lower Jaw to the great or internal Angle of the Orbit, ſending Branches on each ſide to the Muſcles and Integuments.

82. These Branches communicate with each other, eſpecially one which paſſes under the Zygoma, behind the Os Malæ, to the inferiour Orbitary or Spheno-Maxillary Fiſſure, and another ſmall Branch, which runs along the inferiour Portion of the Orbitary Muſcle, to the ſmall or external Angle of the Eye, where it communicates with the Rami Temporales and Frontales.

83. It is here to be obſerved that under the Angle of the lower Jaw, there is a great variety of Communications between the external and internal jugular Veins, and alſo a great variety in the Diſtribution of theſe Veins.

84. Almost all the Ramifications, which at this place go from the external jugular Vein, to be diſtributed on the upper part of the Throat and on the Face in ſome Subjects, ariſe in other Subjects from the internal Jugular; and ſometimes, one part of them comes from the external Jugular, the reſt from the internal.

85. The Trunk of the Vena Angularis having reached the Bones of the Noſe, ſends out a Branch through the lateral Cartilages of the Noſe, which is diſtributed to the Nares; and another which runs down in a winding Courſe to the upper Lip.

86. At the great or inner Angle of the Eye, the ſame Trunk ſends off ſeveral other Branches; the firſt of which goes to the Root of the Noſe, and communicating with its Fellow from the other ſide, gives ſeveral ſmall Veins to the Holes of the Oſſa Naſi.

87. The ſecond Branch runs up on the Forehead, by the Name of Vena Frontalis, antiently Præparata; and is diſtributed to each ſide, communicating with its Fellow, when any ſuch Vein is found.

88. The third Branch enters the Orbit in a winding Courſe, on one ſide of the Cartilaginous Pulley, and communicates with the Sinuſes of the Dura Mater, by the Orbitary Sinus of the Eye.

89. The fourth Branch goes along the Muſculus ſuperciliaris and the upper part of the Orbicularis, to the ſmall or external Angle of the Eye, to communicate with the Vena Temporalis, and with that Vein which runs along the lower part of the orbicular Muſcle, with which it forms a kind of Circle.

*Vena Jugularis externa poſterior, ſive ſuperior.*

90. The poſteriour or ſuperiour external jugular Vein runs up toward the parotid Gland, and lower anteriour part of the Eye, giving out ſeveral conſiderable Branches toward each ſide.

91. At its Origin it ſends out poſteriourly, a principal Branch with its Ramifications, to the Muſcles which cover the Scapula, and Joint of the Humerus, commonly called Vena Muſcularis, and which might be named Super-Humeralis.

92. A little higher, it gives off the Vena Cervicalis which goes to the vertebral Muſcles of the Neck. This Vein communicates with the Humeralis by the ſeveral Areolæ, or venal Maſhes, and they are both ramified in different manners.

93. These Ramifications and Communications are in part covered by the Muſculus Trapezius, and communicate likewiſe with ſome Branches of the Vena Occipitalis, and with a Branch of the ſuperior intercoſtal Vein, which perforates the firſt intercoſtal Muſcle.

94. Near the cervical Vein, but a little more outward, it gives off ſometimes the ſmall Vena Cephalica, which runs down between the Pectoralis Major and Deltoides, as was ſaid Nº 69. and unites with the Vena Cephalica of the Arm, which ſhall be deſcribed hereafter.

95. Backward it detaches the Vena Occipitalis, which is diſtributed on the Occiput, and ſometimes comes from the Vena Vertebralis or Axillaris, *&c.* It likewiſe ſends out a ſmall Vein, which enters the Cranium by the poſteriour Maſtoide Hole, and terminates in one of the lateral Sinuſes of the Dura Mater. This Branch comes ſometimes from another Vein.

96. Having reached as far as the Parotid Gland, it forms Communications with the anteriour external Jugular, under the Angle of the lower Jaw; and then paſſes through the Parotid Gland, between that Angle and the Condyle, giving off a large Branch which communicates with another Branch common to the internal and anteriour external Jugulars.

97. Sometimes there are ſeveral Branches, which having run a very little way, unite together and repreſent the ſhort large Branch, forming Areolæ or Maſhes through which the Nerves paſs.

98. Afterwards it paſſes before the Ear, taking the Name of Vena Temporalis, which is diſtributed to the Temples and lateral Parts of the Head, towards the Occiput and Fore-head. Sometimes the Temporal Vein has two Origins, whereof one is from the Jugularis interna.

99. The Temporal Vein of one ſide communicates above, with its fellow on the other ſide; before, with the Vena Frontalis, and behind, with the Vena Occipitalis. Oppoſite to the Ear, it gives out a large Branch, one Ramus of which runs under the lower Edge of the Zygoma, and then returning, communicates with another Ramus from the ſame Jugularis, a little below the Condyle of the lower Jaw, forming a kind of Iſland irregularly round.

100. Behind this Condyle, it gives Branches to the Temporal Muſcle, to the neighbouring parts of the upper Jaw, and to the inſide of the lower Jaw, almoſt in the ſame manner as is done by the Arteries.

101. Only one of theſe Branches runs from without inward, between the Condyloide and Coronoide Apophyſes, to be diſtributed to the Muſculus Temporalis and Pterygoidæi; ſending off a Ramus to the Maſſeter, in its Paſſage.

*Vena Jugularis Interna.*

102. The internal jugular Vein, is the largeſt of all thoſe that go to the Head; tho' not ſo large as it ſeems to be, when injected.

103. It runs up behind the Sterno-Maſtoidæus and Omo-Hyoidæus which it croſſes; along the ſides of the Vertebræ of the Neck, by the edge of the Longus Colli, to the Foſſula of the Foramen Lacerum of the Baſis Cranii.

104. The firſt Branches which it ſends off are ſmall and go to the Thyroide Glands. About two Fingers breadth higher up, it detaches a middle-ſized Branch which runs laterally towards the Larynx, and may be named Vena Gutturalis.

105. This Guttural Vein divides chiefly into three Branches; the loweſt of which goes to the Thyroide Gland and neighbouring Muſcles; the middle

Branch to the Larynx, Muſculi Thyroidæi, &c. and the third runs upward to the great Communication between the two Jugulares already mentioned. In this, however, there is ſome variety, and I have ſeen the left Guttural Vein go out from the Axillaris.

106. About the ſame diſtance upward, almoſt oppoſite to the Os Hyoides, the internal Jugular gives another Branch, which ſends Rami to the Muſcles belonging to that Bone, and others which communicate with the foregoing Branch. This other Branch runs upward toward the parotid Gland and Angle of the lower Jaw, where it ſends communicating Branches forward and backward to the two external Jugulares.

107. It is at this place likewiſe that the internal Jugular ſomerimes produces the Vena Maxillaris Interna and all its Ramifications, as has been already ſaid in the Deſcription of the Jugularis Anterior Externa.

108. The internal Jugular ſends another Branch backward, which is diſtributed to the Occiput, where it communicates with a Branch of the Vertebralis; and through the poſteriour Maſtoide Hole, with the lateral Sinus of the Dura Mater. This communication is ſometimes by an Anaſtomoſis with a Branch of the external Jugular, or of the Cervicalis, which goes thither.

109. Afterwards it reaches the Foramen Lacerum of the Baſis Cranii, bending a little, and ſending off ſmall Twigs to the Pharynx and neighbouring Muſcles.

*Vena Vertebralis.* 110. The Vertebral Vein ariſes poſteriourly from the Subclavia or Axillaris, ſometimes by two Stems, ſometimes by one, which ſoon afterwards divides into two.

111. The firſt and principal Stem gives out a Branch called Vena Cervicalis, which is diſtributed to the neighbouring Muſcles, and afterwards runs up through the Holes of the tranſverſe Apophyſes of the Vertebræ Colli. This cervical Branch comes ſometimes from the Axillaris.

112. The other Stem of the vertebral Vein runs up on the ſide of the Vertebræ, and having reached the fourth, or ſometimes higher, it runs in between the tranſverſe Apophyſes of that Vertebra and of the fifth, to join the firſt or principal Stem.

113. Thus the vertebral Vein accompanies the Artery of the ſame name, ſometimes in one Trunk, ſometimes in ſeveral Stems, through all the Holes of the tranſverſe Apophyſes of the Vertebræ Colli, all the way to the great Foramen Occipitale, communicating with the occipital Veins and ſmall occipital Sinuſes of the Dura Mater.

114. In its paſſage it gives off one Branch which enters by the poſterior Condyloide Hole of the Os Occipitis, and communicates with the lateral Sinus of the Dura Mater; but it is not always to be met with.

115. As theſe Veins run through the Holes in the tranſverſe Apophyſes, they ſend Branches forward to the anterior Muſcles of the Neck, and to the ſmall interior Muſcles of the Head.

116. Other Branches go likewiſe outward and backward to the Muſculi Tranſverſales and Vertebrales Colli; and inward to the great Canal of

the ſpinal Marrow, where they form Sinuſes, which communicate with thoſe on the other ſide.

117. These vertebral Sinuſes are pretty numerous, and placed one above another all the way to the Occiput; the lower communicate with the upper; and at the great Foramen of the Os Occipitis there is a Communication between them and the occipital Sinuſes of the Dura Mater.

*Vena Axillaris.*

118. The ſubclavian Vein having ſent off the Branches already deſcribed, goes out of the Thorax, and paſſes before the anterior Portion of the Muſculus Scalenus, and between the firſt Rib and the Clavicle, to the Axilla. Through this Courſe it takes the name of Vena Axillaris, and gives off ſeveral Branches, the chief of which are the Venæ Muſculares, Thoracicæ and Vena Cephalica, which is ſometimes double.

119. The firſt Veins which it ſends off are the Muſculares, diſtributed to the middle Portion of the Muſculus Trapezius, to the Angularis, Infra-Spinatus and Subſcapularis; and as ſome of theſe Branches go to the Shoulder exteriourly, others interiourly; the Venæ Scapulares are diſtinguiſhed into external and internal.

120. A little before the Axillaris reaches the Axilla, it ſends out the Venæ Thoracicæ, one of which is ſuperior, called alſo, Mammaria Externa, and the other inferior. It likewiſe ſends Rami to the Muſculus Subſcapularis, Teres Major, Teres Minor, Supra-Spinatus, Latiſſimus Dorſi, Serratus Major, Pectoralis Minor, Pectoralis Major, and to the Glands of the Axilla; and ſometimes gives a communicating Branch to the Vena Baſilica.

*Vena Cephalica.*

121. The Axillaris having reached the ſide of the Head of the Os Humeri, produces a very conſiderable Branch named Vena Cephalica, and afterwards runs along the Arm by the name of Vena Baſilica; which however appears ſometimes to be rather a Branch, than a Continuation of the Trunk of the Axillaris; in which caſe the Cephalica and Baſilica might be looked upon as two principal Branches of the Axillary Vein.

122. The Cephalic Vein which is a Branch of the Axillaris, at a ſmall diſtance from its Origin, joins the ſmall Cephalica which runs down from the Subclavia or Jugularis externa; having till then run near the Surface of the Body between the Deltoides and Pectoralis Major, and ſometimes theſe two Veins communicate before their Union.

123. The great Cephalica runs down between the Tendons of the laſt mentioned Muſcles, and along the outer Edge of the external Portion of the Biceps; communicating ſeveral times with the Vena Baſilica, and ſending ſmall Rami on each ſide, to the neighbouring Muſcles, Fat and Skin. Some Branches go out from its upper part, which, lower down unite again with the Trunk.

124. A little below the external Condyle of the Os Humeri, it detaches a Branch backward, which runs up between the Muſculus Brachialis and the upper Portion of the Supinator Longus, and afterwards bends back between the Os Humeri and Anconæus Externus, where it communicates with ſome Branches of the Baſilica.

125. Having

125. Having reached very near the Fold of the Arm, it is divided into two principal Branches, one long, the other ſhort. The long Branch is named Radialis Externa, and the ſhort one may be called Mediana Cephalica, to diſtinguiſh it from another Mediana, which is a ſhort Branch of the Baſilica; and therefore ought to be called Vena Mediana Baſilica.

126. The external radial Vein runs along the Radius between the Muſcles and Integuments, giving off Branches toward both ſides, which communicate with other Branches of the ſame Vein, and with ſome from the Baſilica, forming Areolæ much in the ſame manner as the Saphena does in the lower Extremity.

127. The Mediana Cephalica runs down obliquely toward the middle of the Fold of the Arm, under the Integuments, and over the Tendon of the Biceps, where it joins a ſhort Branch of the ſame kind from the Baſilica, which I have already named Mediana Baſilica. Theſe two Medianæ unite in an Angle, the Apex of which is turned downward.

128. From this angular Union, or Anaſtomoſis, a conſiderable Branch goes out, which runs down on the Fore-Arm, uniting on one ſide with the Vena Cephalica, and communicating on the other with the Baſilica, by ſeveral irregular Areolæ. The Name of Mediana is given to this large Branch, as well as to the two ſhort ones, by the Union of which it is formed; but that they may not be confounded, this large Branch may be termed Mediana Major or Media, the Names already given to the other two, being retained.

129. From this Union of the two lateral Medianæ, and ſometimes from the Origin of the Mediana Media, which is the true Mediana of *Riolan*, a Branch goes out which runs down on the inſide of the Fore-Arm, oppoſite to the interoſſeous Ligament, and is called Vena Cubiti Profunda. It goes to the neighbouring Muſcles, and communicates with the other Veins of the Fore-Arm. The Mediana Cephalica ſometimes ſends down a long Branch, called Radialis Interna, which lies almoſt parallel to the Radialis Externa already mentioned.

130. Afterwards, the Cephalica having reached the Extremity of the Radius, is diſtributed by numerous Areolæ, almoſt in the ſame *courſe* with the radial Artery.

131. A particular Branch goes out from it, which runs more or leſs ſuperficially between the Thumb and Metacarpus, by the name of Cephalica Pollicis. The Areolæ furniſh the interoſſeous Muſcles and Integuments, and communicate with a ſmall Ramus from the Baſilica, called by the Ancients Salvatella.

*Vena Baſilica.*

132. The Ancients termed the Baſilic Vein of the right Arm, the Vein of the Liver, or Vena Hepatica Brachii; and that of the left Arm, the Vein of the Spleen, or Vena Splenica Brachii. It has ſometimes a double Origin, by a Branch of Communication with the Trunk of the Axillaris.

133. It ſends off firſt of all, under the Head of the Os Humeri, a pretty large Branch, which paſſes almoſt tranſverſely round the Neck of that Bone, from within, backward, and from behind, outward, running up on the Scapula, where it is ramified on the Deltoides, and communicates with the Venæ

Scapulares externæ. This Branch may be named Vena Sub-humeralis or Articularis, as the Artery which lies in the ſame place; they both having much the ſame Courſe.

134. This articular Vein ſends down two principal Branches, one of which runs along the inſide of the Bone, to which, and to the Perioſteum, it gives ſmall Veins. The other turns forward, toward the middle of the Arm between the Bone and the Biceps, and communicates with the Cephalica.

135. Below the Neck of the Os Humeri, near the Hollow of the Axilla, and behind the Tendon of the Pectoralis Major, the Baſilica ſends out a conſiderable Branch, which runs down on the ſide of the Brachial Artery, and furniſhes the neighbouring Muſcles on both ſides. This Vein is named Profunda Brachii, or Profunda ſuperior.

136. Immediately afterwards, the Baſilica detaches two or three ſmall Veins, which run down very cloſely joined to the Brachial Artery, ſurrounding it at different diſtances by ſmall Twigs, which communicate with each other. Theſe Veins might be named Venæ Satellites Arteriæ Brachialis.

137. These ſmall Veins which often ariſe from the Profunda ſuperior, communicate with the Baſilica and Cephalica; and having reached the Fold of the Arm, they divide like the Artery, and the ſame Diviſions are continued along the whole Fore-Arm, through all which Space they accompany and ſurround the arterial Branches, in the manner already ſaid.

138. Afterwards the Baſilica continues its Courſe along the inſide of the Os Humeri, between the Muſcles and Integuments, forming many Communications with the Vena Profunda, Satellites and Cephalica, and ſupplying the Muſcles and Integuments.

139. Having reached the inner Condyle, and having ſent off obliquely in the Fold of the Arm, the Mediana Baſilica, it runs along the Ulna, between the Integuments and Muſcles, a little toward the outſide, by the name of Cubitalis externa, ſtill communicating with the Profunda, Satellites and Cephalica.

140. Having detached the Mediana Baſilica, it ſends out another Branch, which runs down along the inſide of the Fore-Arm near the Ulna, and communicates with the Mediana major, *&c.* This Branch may be named Cubitalis interna.

141. The Baſilica having at length reached the Extremity of the Ulna, ſends ſeveral Branches to the convex ſide of the Carpus; one of which named Salvatella, goes to that ſide of the Little Finger next the Ring Finger, having firſt communicated with the Cephalica, by means of the Venal Areolæ conſpicuous on the back of the Hand. In the other Fingers this Vein follows nearly the ſame Courſe with the Artery.

142. In general, the external or ſuperficial Veins of the Fore-Arm are larger than the internal; but they are accompanied only by ſmall Arteries; whereas the deep Veins accompany large Arteries.

143. The inferiour Vena Cava having run down about a quarter of an inch from the right Auricle of the Heart, within the Pericardium, as has been *Vena Cava Inferior.*

been already ſaid, pierces that Membrane, and the tendinous Portion of the Diaphragm which adhere very cloſely to each other.

144. At this place it gives off the Venæ Diaphragmaticæ or Phrenicæ, which are diſtributed to the Diaphragm, and appear chiefly on its lower ſide, one towards the right hand, and one toward the left. The right Vein is more backward and lower than the left. The left is diſtributed partly to the Pericardium, and partly to the Diaphragm; and ſometimes they ſend Rami to the Capſulæ Renales, much in the ſame manner as the Arteriæ Phrenicæ.

145. The inferiour Cava having perforated the Diaphragm, paſſes through the poſteriour part of the great Fiſſure of the Liver, penetrating a little into the Subſtance of that Viſcus, between the great Lobe and the Lobulus Spigelii, being however covered but very little on the back ſide by the Subſtance of the Liver, till it reaches the Lobulus.

146. In its paſſage, it ſends off commonly three large Branches, called Venæ Hepaticæ, which are ramified in the Liver. Sometimes there are only two, and ſometimes four.

147. Besides theſe large Branches, it ſends out ſome other ſmall ones, either before or immediately after it goes out of the Liver; which, according to ſome Anatomiſts, anſwer to the Branches of the Hepatic Artery, as the large Branches do to thoſe of the Vena Portæ.

148. In the Fœtus, as the Vena Cava paſſes by the Liver, it gives off the Ductus Venoſus, which communicates with the Sinus of the Vena Portæ, and in Adults is changed to a flat Ligament.

149. After its paſſage through the Liver, the Vena Cava turns from before backward, and from right to left, toward the Spina Dorſi, placing it ſelf on the right ſide of the Aorta, which it accompanies from thence downward.

150. Having got as low as the Arteriæ Renales, it gives off the Veins of the ſame name, termed formerly Venæ Emulgentes, and which are the largeſt of all the Veins that go from the Cava inferior, from the Liver to the Bifurcation.

151. The right Renal Vein is the ſhorteſt, and runs down a little obliquely becauſe of the Situation of the Kidney. The left Vein, which is the longeſt, croſſes on the foreſide of the Trunk of the Aorta, immediately above the ſuperiour Meſenteric Artery; and both Veins accompany the Renal Arteries.

152. They ſend up the Venæ Capſulares, which go to the Glandulæ Renales, and downward, the Venæ Adipoſæ, which go to the fatty covering of the Kidneys; and ordinarily the left Renal Vein furniſhes the left Spermatic Vein. Afterward they run to the Sinus or Cavity of the Kidneys, in the Subſtance of which they are diſtributed by numerous Ramifications.

153. A little below the Renal Veins, the Trunk of the Cava ſends out anteriourly toward the right ſide, the right Vena Spermatica. The left ſpermatic Vein comes commonly, tho' not always, from the left Renalis, as has been already obſerved. Both Veins accompany the ſpermatic Arteries, to the Parts to be mentioned hereafter.

154. In their paſſage, they ſend ſeveral ſmall Branches on each ſide, to the Peritonæum and Meſentery, where they ſeem to be joined by Anaſtomoſes with the Venæ Meſaraicæ, and conſequently with the Vena Portæ.

155. They ſometimes ſend a conſiderable Branch over the Iliac Muſcle, which afterwards dividing into two, one Ramus runs up to the Membrana Adipoſa of the Kidneys, the other runs down on the laſt-mentioned Muſcle.

156. About the ſame height with the ſpermatic Vein, the inferiour Cava ſends off poſteriourly in ſome Subjects, a Branch which runs upward, and communicates with the Vena Azygos. Sometimes this Branch goes out from one or other of the Renales, and appears to be a true Continuation of the Extremity of the Azygos.

157. The Cava ſends likewiſe off poſteriourly the Venæ Lumbares, which commonly ariſe in Pairs in the ſame manner as the Arteries of the ſame name go out from the Aorta. Theſe may be divided into ſuperiour and inferiour Veins.

158. Their Origins vary in different manners. Sometimes the Cava gives off a Branch to each ſide below the firſt Vertebra of the Loins, which, like a common Trunk, furniſhes the Lumbar Veins. This Branch communicates with the Azygos.

159. Sometimes a conſiderable Branch goes out from the lower Extremity of the Cava, near the Bifurcation, cheifly on the right ſide; which afterwards running up between the Bodies and tranſverſe Apophyſes of the Vertebræ, detaches the Venæ Lumbares, and communicates with the Azygos.

160. Sometimes a like Branch comes from the beginning of the left Vena Iliaca, and running up on that ſide in the ſame manner, produces the Lumbares. This Branch likewiſe communicates with the Azygos, and with the ſuperiour or deſcending Ramus Lumbaris.

161. The Venæ Lumbares on one ſide, communicate by tranſverſe Branches with thoſe of the other ſide, and likewiſe with each other by Branches more or leſs longitudinal. The firſt and ſecond often go from the Azygos, and thereby they communicate with the intercoſtal Veins.

162. The Lumbar Veins ſend ſmall Capillaries, in their paſſage, to the Subſtance of the Bodies of the Vertebræ; and they are diſtributed to the Muſcles of the Abdomen, Quadratus Lumborum, Pſoas, Iliacus, *&c.* They ſend Branches backward to the neighbouring vertebral Muſcles, and to the Canal of the Spine, and communicate with the venal Sinuſes in the ſame manner as the Intercoſtals.

163. The inferiour Cava having reached as low as the laſt Vertebra of the Loins, and near the Bifurcation of the Aorta, runs in behind the right Iliac Artery, and there is divided into two Subaltern Trunks, called the right and left Iliac Veins.

164. The Extremity of the Trunk of the Vena Cava, paſſes in ſome Subjects behind the Origin of the right Iliac Artery; in others, it is the left Iliac Vein which paſſes there, and conſequently croſſes the right Iliac Artery.

Afterward the left Iliac Vein accompanies the inſide of the left Artery, till it goes out of the Abdomen. Therefore the Iliac Veins lie on the inſides of the Arteries at this place.

165. From this Bifurcation of the Vena Cava, and often from the Origin of the left Iliaca, the Vena Sacra goes out, and accompanies the Artery of the ſame name in its diſtribution to the Os Sacrum, to the Nerves which lie there, and to the Membranes which cover both ſides of that Bone.

*Venæ Iliacæ.* 166. Each original Iliac Vein is divided on the ſide of the Os Sacrum, much after the ſame manner as the Arteries, into two large Trunks, or ſecondary Iliac Veins. This ſecond Bifurcation is about a Finger's breadth below that of the Iliac Arteries.

167. One of theſe Trunks is named Vena Iliaca Externa, or Anterior; the other, Interna, or Poſterior. The external Vein is likewiſe named ſimply Iliaca, and the Internal, Hypogaſtrica. The external Vein ſeems to be the true Continuation of the Trunk, and the Hypogaſtrica only a Branch. I here ſpeak of adult Bodies, becauſe in the Fœtus there is a conſiderable Variation.

168. These Veins follow nearly the Courſe and Diſtribution of the Iliac Arteries, except that the Hypogaſtric Vein does not ſend off the Vena Umbilicalis. The external Iliac Veins lie more or leſs on the inſide of the Arteries, in the manner already ſaid; but the Hypogaſtric Veins, in the bottom of the Pelvis, lie almoſt behind the Arteries on the ſame ſide.

169. From the common Trunk of the Iliac Veins, and ſometimes from the Origin of the Iliaca Externa, a particular Branch goes out, which is diſtributed to the Muſculus Pſoas, Iliacus, and Quadratus Lumborum; and afterwards ſends a Ramus on the fore-ſide of the laſt tranſverſe Apophyſis of the Loins, to communicate with the laſt Lumbar Vein.

170. The external Iliac, a little before it leaves the Abdomen, near the Ligamentum Falloppi, lying on the Pſoas and Iliac Muſcles, gives off almoſt the ſame Branches with the Artery of the ſame name, and follows the ſame Courſe. The chief Branches are theſe.

171. A little before it goes out of the Abdomen, it ſends off from the outſide, a ſmall Branch, which runs up along the Criſta of the Os Ilium, and gives Branches on each ſide, to the lateral and poſteriour lower Portions of the Muſculi Abdominis, to the Muſculus Iliacus, &c.

172. From the inſide, before it leaves the Abdomen, it ſends off the Vena Epigaſtrica; which having furniſhed ſome ſmall Rami to the neighbouring conglobated Glands, runs up along the inſide of the Muſculi Recti, on which it is ramified both ways; as alſo on the broad Muſcles of the Abdomen, by other ſmall Branches, which penetrate from within outwards.

173. Afterwards, the Vena Epigaſtrica runs upward, and joins the Ramifications of the Mammaria, by an equal Number, accompanying the Epigaſtric Artery. From the inſide of the Epigaſtric Vein, a Branch is ſometimes detached to the Muſculus Obturator Internus, where it joins another Ramus named Vena Obturatrix.

174. Before the Iliac Vein gets from under the Ligamentum Falloppii, it ſends ſeveral ſmall Rami to the neighbouring Lymphatic Glands; and immediately afterwards, loſing the name of Iliaca, it takes that of Cruralis.

175. The Hypogaſtric or internal Iliac Vein, runs behind the Artery of the ſame name, making the ſame kind of Arch, from which the following Branches go out. *Vena Hypogaſtrica.*

176. From the poſteriour or convex part of the Arch, it gives a Branch to the ſuperiour lateral part of the Os Sacrum, which is diſtributed to the Muſculus Sacer or Tranſverſo-Spinalis Lumborum, and other Muſcles thereabouts, and to the Cavity of the Bone, which it enters through the firſt great Hole.

177. A little lower, on the ſame ſide, it ſends out another, which is diſtributed much in the ſame manner with the former, and enters the ſecond Hole.

178. From the external lateral part of the ſame Arch, a little anteriourly, it ſends out a large Branch, which runs behind the great Sciatic Sinus, and is diſtributed to the Muſculi Glutæi, Pyriformis and Gemelli.

179. Lower down, the ſame lateral part of the Hypogaſtric Vein gives out another large Branch; which having run a little way, detaches ſeveral Rami, and afterwards reaching the Foramen Ovale of the Os Innominatum, perforates the Obturator Muſcles, communicates with the Vena Cruralis, and is diſtributed to the Muſculus Pectineus, Triceps, and neighbouring Parts. This Vein is termed Obturatrix, from its paſſing thro' the Muſcles of that name.

180. Among the Branches ſent off by the Vena Obturatrix, before it perforates the Muſcles, one is ſituated exteriourly, which runs toward the Sciatic Sinus, to the Muſculus Iliacus, the ſuperiour part of the Obturator Internus, and to the Os Ilium, near its Symphyſis with the Os Iſchium.

181. Interiourly, the ſame Obturator Vein ſends off another Branch, which is diſtributed to the Ureters, Bladder, and internal parts of Generation in both Sexes. It communicates with the Spermatic Veins, and is more conſiderable in Women than in Men.

182. Lastly, the Hypogaſtric Vein runs backward, and goes out of the Pelvis, above the Ligament which lies between the inferiour lateral part of the Os Sacrum and Spine of the Iſchium; and as it goes out, it is ramified chiefly upward and downward.

183. It ſends a large Branch upward to the lower part of the Os Sacrum, and two or more downward; which running behind the ſame Ligament, are diſtributed to the Buttocks, Anus, neighbouring Portion of the Muſculus Pectineus, and to the external Parts of Generation, nearly in the ſame manner with the Artery which accompanies them.

184. The Veins that go to the Anus, are termed Hæmorrhoidales Externæ, and they that go to the Parts of Generation, Pudicæ Internæ. The external Hæmorrhoidales communicate with the internal Veins of the ſame Name, which come from the ſmall Vena Meſaraica, one of the Branches of the Vena Portæ, as we ſhall ſee hereafter.

*Vena Cruralis.* 185. The Crural Vein goes out under the Ligamentum Falloppii, on the inſide of the Crural Artery, and immediately gives ſmall Branches to the Inguinal Glands, the Muſculus Pectineus, and Parts of Generation. Theſe laſt are termed Pudicæ Externæ, and evidently communicate with the internal Veins of the ſame name.

186. About an Inch below where it leaves the Abdomen, the Crural Vein produces a large Branch, which runs down anteriourly between the Integuments and the Sartorius, following the Direction of that Muſcle almoſt all the way to the inſide of the Thigh.

187. This Branch having afterwards got beyond the Condyles of the Os Femoris, runs down between the Integuments and inner Angle of the Tibia, to the fore part of the inner Ankle, and is diſtributed to the Foot. All this large Branch is named Vena Saphena, or Saphena Major.

188. After the Origin of the Saphena, as the Trunk of the Crural Vein runs down, it ſinks in between the Muſcles, and is diſtributed to all the inner or deep parts of the lower Extremity, accompanying the Crural Artery to the very Extremity of the Foot, being all along more conſiderable than the Artery, both for Capacity and Ramifications, a thing very common in the Veins.

189. As the Saphena is a Vein of very large extent, I ſhall here deſcribe it altogether, and afterwards return to the Vena Cruralis.

*Vena Saphena.* 190. The Vena Saphena, in its paſſage from the Inguen to the Foot, is covered only by the Skin and Fat. Immediately after its riſe, it gives ſmall Veins to the inferiour Inguinal Glands; and then it gives out others more anteriourly, which running under the Integuments, communicate with each other by numerous Areolæ, or Maſhes. Sometimes theſe Communications come all from the Rami of one Branch.

191. The Saphena having run down on the Thigh, as low as the middle of the Sartorius, ſends off to the ſame ſide ſeveral Branches, which communicate with each other, and with the ſuperiour Branches already mentioned; and as they run down, they communicate again with the Trunk of the Saphena.

192. These two ſorts of Communications furniſh a third collateral kind, from which likewiſe particular Branches are detached, which communicate with each other at different diſtances all the way to the Knee.

193. Between theſe upper and lower Branches, the Saphena ſends backward a particular Branch; which, after being diſtributed to the Integuments which cover the Gracilis Internus and Triceps, turns backward; and a little below the Ham, runs in among the Muſcles ſituated there, and communicates with another Branch, which may be termed Saphena Minor.

194. Afterwards the Trunk of the great Saphena runs down on the inſide of the Tibia, lying always near the Skin; and at the upper part of that Bone, it ſends Branches forward, outward and backward.

195. The anteriour Branches go to the Integuments on the upper part of the Leg; the poſteriour, to thoſe which cover the Gaſtrocnemii, and communicate with the little Saphena; and the external Branches are likewiſe

diſtributed to the Fat and Integuments, and having reached as low as the middle of the Tibia, it ſends a communicating Branch to the Trunk of the great Saphena.

196. From this Communication, a Branch goes out anteriourly, which runs along the Integuments of the Tibia all the way to the outer Ankle, having in its paſſage communicated again with the great Saphena.

197. As the Saphena runs down on the inſide of the Tibia, it ſends out a Branch near the middle of that Bone, which runs up behind the Tendons of the Sartorius, Gracilis Internus, and Semi-Nervoſus, then between the Tibia and upper end of the Soleus, and is joined by an Anaſtomoſis with the Crural Vein.

198. It likewiſe detaches to the fore part of the Tibia ſome Branches irregularly tranſverſe; which having been diſtributed to the Perioſteum and Bone, communicate with other Branches already mentioned.

199. At the lower part of the Tibia, the Saphena produces a conſiderable Branch, which runs obliquely forward over the Joint of the Tarſus toward the outer Ankle, ſending off ſeveral Rami which communicate with each other, and with the Trunk of the Saphena.

200. Lastly, the Extremity this Trunk paſſes on the foreſide of the inner Ankle, and runs irregularly under the Skin, along the Interſtice between the firſt two Metatarſal Bones toward the Great Toe, where this Vein terminates.

201. Having got below the inner Ankle, it ſends a Branch outward and forward, which runs under, and in ſome meaſure accompanies the anteriour Tibial Artery. Interiourly it ſends another Branch, almoſt from the ſame place, which paſſes under the Foot, communicating with the external Tibial Vein by irregular Arches, from which Veins are ſent to the Toes.

202. Lastly, before the Saphena terminates at the Great Toe, it detaches a kind of tranſverſe Arch over the Metatarſus, which communicates by ſeveral Branches with that Arch which lies on the Joint of the Tarſus, and ſends others to the Toes. This Arch gives off likewiſe another Branch, which runs up behind the outer Ankle, and communicates with the Vena Tibialis Externa.

*Continuation of the Vena Cruralis.*

203. The Crural Vein having ſent off the Saphena, and the ſmall Branches for the Pectineus, *&c.* as has been ſaid, runs down on the Thigh behind the Crural Artery. Oppoſite to the little Trochanter, it produces two large ſhort Branches, or one which afterwards divides into two, whereof one is anteriour, the other poſteriour.

204. The anteriour Branch runs more or leſs tranſverſely forward, to be diſtributed to the Vaſtus Internus, lower part of the Pectineus, and of the ſecond Triceps, and to the other two Muſcles of the ſame name, running in between them as it goes from one to the other.

205. The poſteriour Branch runs more or leſs tranſverſely backward, and furniſhes the Glutæi, Vaſtus Externus, and beginning of the Biceps.

206. A Little below theſe two Branches, about the upper Extremity of the Vaſtus Internus, the Crural Vein produces a Branch which runs down on the ſide of the Trunk, covering the Crural Artery, almoſt as low as the Ham, where it is again united to the Trunk by an Anaſtomoſis, and ſometimes it is continued ſeparate a little way down on the Leg. It has the name of Vena Sciatica from the Sciatic Nerve which it accompanies.

207. On the outſide of this Anaſtomoſis, the Crural Vein gives off a Branch which runs backward between the Biceps and neighbouring Muſcles, and ſo downward on the backſide of the Leg a little exteriourly, and very near the Skin, all the way to the outer Ankle. This Vein is termed Saphena minor or externa.

*Saphena Minor.*

208. The little Saphena having got near the Integuments in its Courſe downward, gives out a Branch which runs backward, and communicates with the great Saphena about the middle of the backſide of the Thigh, as has been already obſerved.

209. Immediately above and below the Ham, this Vein ſends out other Branches, which likewiſe communicate with the Saphena Major, and having run down about one third part of the backſide of the Tibia, it ſends off another Branch which is afterwards re-united to the Trunk.

210. About the Beginning of the Tendo Achillis, the little Saphena runs outward in the Integuments, toward the outer Ankles, where it terminates in cutaneous Ramifications ſent to every ſide.

*Vena Poplitea.*

211. The crural Vein having detached the little Saphena, runs down between the Biceps and the other Flexors of the Leg, cloſely accompanied by the crural Artery, between which and the inner Condyle of the Os Femoris, it is ſituated.

212. A little above the Ham, it takes the name of Vena Poplitea, and as it runs down betwixt the two Condyles, it gives Branches to the Flexor Muſcles above-mentioned, to the lower and poſteriour Parts of both Vaſti, and to the Fat which lies above the Interſtices of the two Condyles.

213. It likewiſe gives off ſeveral other Branches, one of which runs up laterally between the outer Condyle and the Biceps, and then turning forward, is ramified in the ſame manner with the Artery. Another Branch goes backward, ſending Ramifications to the beginning of the Gaſtrocnemii, after which it runs down on the backſide of theſe Muſcles to the Tendo Achillis.

214. Near the internal Condyle, the Poplitea ſends ſome lateral Branches to the Extremities of the neighbouring Muſcles, eſpecially thoſe of the Semi-Nervoſus, Semi-Membranoſus, *&c.* Laſtly, it ſends a Branch toward the external Condyle, which having run for a ſmall ſpace on the Peronæus Longus, goes back again into the Trunk.

215. The Vena Poplitea runs down immediately behind the Muſcle of the ſame Name, at the lower Part of which it ſends off ſeveral Ramifications to each ſide, which divide and unite again in different Ways and Degrees; and afterwards it loſes its Name, being divided into three conſiderable Branches, called Tibialis anterior, Tibialis poſterior, and Peronæa; of

which the Tibialis poſterior is moſt frequently a Continuation of the Trunk, and the other two like Branches.

*Vena Tibialis Anterior.*

216 The Anterior Tibial Vein having diſtributed ſome ſmall Branches from its very Beginning to the Muſcles behind the Heads of the two Bones of the Leg, perforates the interoſſeous Ligament from behind, forward, and runs between the ſuperior Portions of the Muſculus Tibialis Anticus, and Extenſor Digitorum communis.

217. As ſoon as it pierces the interoſſeous Ligament, it diſtributes ſmall ſuperficial Branches to the Head of the Tibia and Fibula, which run to the Joint of the Knee, and communicate with the lateral Branches of the Vena Poplitea, already mentioned.

218. Afterwards it divides into two or three Branches, which run down together on the Foreſide of the interoſſeous Ligament in Company with the anteriour Tibial Artery, which they ſurround at different diſtances, by ſmall communicating Circles.

219. These Branches having reached the lower Extremity of the Leg, unite in one, which afterwards divides into ſeveral, the Ramifications of which are diſtributed to the Foot.

220. A particular Branch goes out from the re-united Portion, which at the lower part of the Leg, perforates the interoſſeous Ligament from before backward, and communicates with the Vena Tibialis poſterior.

*Vena Tibialis Poſterior.*

221. The poſteriour Tibial Vein gives off from its Beginning, a Branch toward the inſide, which is diſtributed to the Gaſtrocnemii and Soleus. This Vein is named Suralis.

222. Afterward the poſterior Tibialis runs down between the Soleus and Tibialis Poſticus, giving Branches to each of them. It is divided in the ſame manner as the Tibialis anterior, into two or three Branches, which as they run, ſurround the correſponding Artery, by ſmall communicating Circles formed at different diſtances.

223. It continues this Courſe in company with the Artery as low as the outer Ankle, furniſhing the Muſculus Tibialis Poſticus, and the long Flexors of the Toes. At the lower part of the Leg, it communicates with a tranſverſe Branch of the Saphena, and with the anteriour Tibial Vein, in the manner already ſaid.

224. Lastly, it paſſes on the inſide of the Os Calcis, under the Sole of the Foot, where it forms the Venæ Plantares, by dividing into ſeveral tranſverſe Arches, which communicate with each other, and with the Saphena, and ſend Ramifications to the Toes, nearly in the ſame manner as the Arteria Plantaris.

*Vena Peronæa.*

225. The Vena Peronæa is likewiſe double, and ſometimes triple. It runs down on the inſide of the Fibula, almoſt in the ſame Direction with the Arteria Peronæa, which it likewiſe ſurrounds at different diſtances, by communicating Branches; after the manner of the Tibialis poſterior.

226. It runs down as low as the outer Ankle, communicating ſeveral times with the Tibialis poſterior, and ſending Ramifications to the neighbouring Portions of the Muſculi Peronæi, and long Flexors of the Toes.

227. The laſt of theſe Communications makes the Venæ Plantares in ſome Subjects, to appear rather to come from this Vein, than from the Tibialis Poſterior, from which they commonly ariſe, as we have alraedy obſerved.

*Vena Portæ.* 228. The Vena Portæ is a large Vein, the Trunk which is ſituated chiefly between the Eminences on the lower or concave ſide of the Liver, called Portæ by Anatomiſts; and from thence this Vein has got the general Name of Vena Portæ, or Vena Portarum.

229. It may be conſidered as made up of two large Veins, joined almoſt endwiſe by their Trunks, from each of which, the Branches and Ramifications go out in contrary or oppoſite Directions. One of theſe Trunks adheres to the Liver, and is ramified in that Viſcus, its Branches accompanying the whole Diſtribution of the Hepatic Artery.

230. The other Trunk is without the Liver, and ſends its Branches to the Viſcera ſupplied by the reſt of the Arteria Cæliaca, and by the two Meſentericæ, that is, to the Stomach, Inteſtines, Pancreas, Spleen, Meſentery, and Omentum.

231. The firſt Portion of this Vein, may be termed Vena Portæ Hepatica, Superior or Minor, the Trunk of which is commonly known by the name of Sinus Venæ Portarum. The other Portion may be called Vena Portæ Ventralis, Inferior or Major; and this is what I am now to deſcribe, referring the Diſtribution of the other to the Hiſtory of the Liver.

232. The large Trunk of the Vena Portæ Inferior or Ventralis, is ſituated under the lower or concave ſide of the Liver, and joined by an Anaſtomoſis to the Sinus of the Vena Portæ Hepatica, between the middle and right Extremity of that Sinus, and conſequently at a good diſtance from the left Extremity. From thence it runs down a little obliquely from right to left, behind or under the Trunk of the Arteria Hepatica, bending behind the Beginning of the Duodenum, and under the Head of the Pancreas; its length being about five Fingers breadth.

233. Having reached to the Head of the Pancreas, this Trunk loſes the general name of Vena Portæ, and terminates in three large principal Branches, which are diſtributed by numerous Ramifications, to the Viſcera already named. The firſt Branch is termed Vena Meſaraica, or Meſaraica Major; the ſecond, Splenica; and the third, Hæmorrhoidalis Interna, or Meſaraica Minor.

234. The Vena Meſaraica Major appears to be a Continuation of the Trunk of the Vena Portæ Inferior. The Splenica is a capital Branch of that Trunk; and the Hæmorrhoidalis Interna has ſometimes a common Origin with the Splenica, and ſometimes is no more than a Branch of that Vein. In ſome Subjects the Meſaraica Major and Splenica appear to ariſe by an equal Bifurcation of the Trunk of the inferior Vena Portæ, and in others, the Hæmorrhoidalis ariſes from the very Angle of that Bifurcation.

235 The inferior Vena Portæ, before the Formation of theſe three Branches, ſends off from the Trunk ſeveral ſmall Rami, which are commonly the Venæ Cyſticæ, Hepatica Minor, Pylorica, Duodenalis, and ſometimes the Gaſtrica Recta, and Coronaria Ventriculi.

236. All theſe ſmall Veins ſometimes ariſe ſeparately; and in other Subjects, ſome of them go out by ſmall common Trunks. It ſometimes happens that ſeveral of them do not come immediately from the Trunk of the Vena Portæ, but from one of its great Branches.

237. The Cyſtic Veins run along the Veſicula Fellis from its Neck to the Bottom; and as they are often no more than two in number, they are called Cyſticæ Gemellæ, a name given likewiſe to the Arteries which accompany them. They go out from the right ſide of the great Trunk near its beginning, ſometimes ſeparately, ſometimes by a ſmall and very ſhort common Trunk.

238. The ſmall Hepatic Vein is commonly a Branch of one of the Cyſticæ, or of their common Trunk.

239. The Vena Pylorica ariſes from the great Trunk, almoſt oppoſite to the Origin of the Cyſticæ; and ſometimes is only a Branch of the right Gaſtrica. It paſſes over the Pylorus to the ſhort Arch of the Stomach, where it is join'd by Anaſtomoſis with the Coronaria Ventriculi.

240. The Duodenal Vein, commonly called Vena Inteſtinalis, goes out from the great Trunk near the Cyſticæ, and ſometimes from the ſmall common Trunk of theſe Veins. It is diſtributed chiefly to the Inteſtinum Duodenum, and ſends likewiſe ſome Rami to the Pancreas. There is another Vein called alſo Duodenalis, which is a Branch of the Gaſtrica of the ſame ſide.

241. The Vena Gaſtrica, or Gaſtro-Epiploica Dextra, and the Coronaria Ventriculi, come more ſeldom from the Trunk of the Vena Portæ, than from its great Branches, with which I therefore chuſe to deſcribe them.

*Vena Meſaraica Major.*

242. The inferiour Vena Portæ, having given off the Splenica, changes its Name to that of Meſaraica, or Meſaraica Major, which often appears to be rather a Continuation of the Trunk, than one of the great Branches, as has been already obſerved.

243. It bends toward the ſuperiour Meſenteric Artery, ſending off two Veins, and afterwards running up over that Artery, it accompanies it in thoſe Portions of the Meſentery and Meſocolon which belong to the ſmall Inteſtines, the Cæcum, and right Portion of the Colon. As it runs down, it forms an oblique Arch almoſt like that of the Artery, which is likewiſe ramified on both the convex and concave ſides, but not ſo regularly.

244. The firſt particular Branch from this Trunk is called by *Riolan* Vena Colica. It goes out from the anteriour part of the Trunk, before it joins the Artery, and runs directly to the middle of the Colon, where it divides to the right and left, and forms Arches. On the left hand it communicates with the ſuperiour or aſcending Branch of the Hæmorrhoidalis; and on the right, with the ſecond Branch of the Meſaraica.

245. This ſecond Branch is a little under the firſt, or Colica anterior, and ſomething more toward the right hand. It may be named Gaſtro-Colica, and is ſoon divided into two Branches, one ſuperiour, the other inferiour.

246. The ſuperiour Branch of the Vena Graſtro-Colica, ſends ſmall Veins to the Head of the Pancreas, and forms the Vena Gaſtrica, or Gaſtro-Epiploica Dextra, which goes from the Pylorus to the great Curvature of the Stomach, and communicates with the Gaſtrica Siniſtra. In its paſſage it ſupplies the Stomach and Omentum, and communicates with the Pylorica, Coronaria Ventriculi, *&c.* as has been already ſaid; and ſometimes it forms the Pylorica.

247. The inferiour Branch of the Vena Gaſtro-Colica, which may be called Colica Dextra, goes to the right Portion of the Colon; and from thence to the upper part of that Inteſtine, where it is divided archwiſe, and communicates with the right Branch of the Colica Anterior, and with a Branch of the Vena Cæcalis, as we ſhall ſee hereafter.

248. The Trunk of the great Meſaraic Vein ſends out ſometimes, oppoſite to the Gaſtrica, a particular Branch to the Omentum, called Epiploica Dextra. But almoſt immediately before it aſcends over the Meſenteric Artery, it produces two large Branches very near each other, which paſs behind and under the Artery, being diſtributed to the Jejunum and part of the Ilium by numerous Ramifications, which form Arches and Areolæ like thoſe of the Artery.

249. Afterwards the Trunk of the Meſaraica paſſes over the ſuperiour Meſenteric Artery, to which it adheres very cloſely, and from the convex ſide of its Arch ſends out ſeveral Branches almoſt in the ſame manner with the Artery; but with this difference, that oftentimes the Branches do not ariſe immediately from the Vein in ſo great numbers; and each of them ſends out many more Ramifications.

250. From the concave ſide of the Meſaraic Vein, a little below the Origin of the ſecond Branch from the convex ſide, ariſes a Branch called by *Riolan* Vena Cæcalis, which runs to the beginning of the Colon, croſſing one of the Branches of the ſuperiour Meſenteric Artery.

251. This Cæcal Vein divides by two Arches, the uppermoſt of which communicates with the lower Branch of the Vena Gaſtro-Colica; the other, after having ſent Ramifications to the Inteſtinum Cæcum, and Appendicula Vermiformis, communicates below, with the Extremity of the great Meſaraic Vein.

*Vena Splenica.* 252. The Splenic Vein is one of the three great Branches of the Vena Portæ, and may be ſaid in ſome meaſure to be a ſubordinate Trunk of that Vein. It runs tranſverſely from the right to the left, firſt under the Duodenum, and then along the lower ſide of the Pancreas, near the poſteriour Edge.

253. In this courſe it gives off ſeveral Veins, *viz.* the Vena Coronaria Ventriculi, Pancreaticæ, Gaſtrica, or Gaſtro-Epiploica Siniſtra, and Epiploica Siniſtra. It likewiſe often gives Origin to the Hæmorrhoidalis Interna, the third capital Branch of the Vena Portæ.

254. It terminates afterwards by a winding Courſe, being divided into ſeveral Branches that go to the Spleen; one of which produces the ſmall Veins called by the Ancients Vaſa Brevia.

255. The Coronaria Ventriculi, ſo called becauſe it ſurrounds more or leſs the upper Orifice of the Stomach, runs along the ſmall Arch of that Viſcus toward the Pylorus, where it joins and becomes continuous with the Vena Pylorica. In its Paſſage, it gives ſeveral Rami to the ſides of the Stomach, which there form numerous Areolæ, and communicate with the Veins of the great Arch.

256. It ariſes pretty often from the beginning of the Splenica, and ſometimes from the left ſide of the Extremity of the great Trunk of the Vena Portæ, behind the Hepatic Artery; and in that caſe, it is the moſt conſiderable of all the ſmall Veins that go out from the great Trunk.

257. The Venæ Pancreaticæ are ſeveral ſmall Branches ſent by the Splenica to the Pancreas, along its lower ſide. There are other ſmall Pancreatic Veins which do not ariſe from the Splenica, as has been ſaid in the Deſcription of the Gaſtro-Colica, one of the Branches of the great Meſaraic Trunk.

258. The left Gaſtric or Gaſtro-Epiploic Vein, goes out from the Splenica at the left Extremity of the Pancreas; from whence it runs to the great Extremity of the Stomach, and along the great Arch, till it meets the Gaſtrica Dextra, which is continuous with the Siniſtra.

259. In its paſſage, it gives ſeveral Branches to both ſides of the Stomach, which are diſtributed by numerous Ramifications, form many Areolæ, and communicate with the Branches of the Coronaria Ventriculi.

260. At a ſmall diſtance from its Origin, this Gaſtric Vein ſends out a Branch, which is diſtributed to the Omentum; and on this account it has been called Gaſtro-Epiploica. This Branch ſeems to communicate with the Hæmorrhoidalis Interna.

261. The Vena-Epiploica Siniſtra ariſes at the ſmall Extremity of the Pancreas, and is ramified on the Omentum all the way to the Colon, where it communicates with the Hæmorrhoidalis Interna. When this Vein is wanting, the Branch of the left Gaſtrica already mentioned, ſupplies its place. It ſometimes comes from the moſt Anteriour Branch, which the Splenica ſends to the Spleen.

262. Lastly, the Vena Splenica reaches the Fiſſure of the Spleen, which it enters through its whole length by ſeveral Branches, almoſt in the ſame manner as the Splenic Artery. It is from the moſt poſteriour of theſe Branches that the Veins are ſent off to the great Extremity of the Stomach, formerly known by the name of Vaſa Brevia, which communicate with the Coronaria Ventriculi and Gaſtrica Siniſtra.

*Vena Hæmorrhoidalis Interna, ſive Meſaraica Minor.*

263. The internal Hemorrhoidal Vein is one of the three great Branches of the Vena Portæ, coming ordinarily from the beginning of the Vena Splenica, and ſometimes from the Extremity or Angle of the Bifurcation of the great Trunk of the Vena Portæ.

264. At a ſmall diſtance from its beginning, it gives to the Duodenum a ſecond Vena Duodenalis, which is ſometimes more conſiderable than the firſt, or that which comes from the great Trunk of the Vena Portæ.

265. Afterwards it is divided into two Branches, one ſuperiour or aſcending, the other inferiour or deſcending. The firſt runs to the upper part

of the Arch of the Colon, where, after many Ramifications it communicates with a Branch of the great Meſaraica, with the Ramifications of the Gaſtro-Epiploica Siniſtra, and with thoſe of the neighbouring Epiploica.

266. The inferiour Branch runs down on the left Portion of the Colon, on the lower Incurvations of that Inteſtine, and on the Rectum all the way to the Anus. In this Courſe, it ſupplies the Meſocolon, and forms Arches, which ſend out numerous ſmall Ramifications which ſurround theſe Inteſtines. It ſeems likewiſe to communicate by ſome capillary Twigs with the left Spermatick Vein.

267. This Vein has been named Hæmorrhoidalis from the Tumours often found at its Extremity next the Anus, which are called Hæmorrhoides. The word Interna is added to diſtinguiſh this Vein from the Hæmorrhoidalis Externa, which comes from the Vena Hypogaſtrica, and with which this Vein communicates by capillary Ramifications. The name of Meſaraica Minor agrees to it very well, becauſe of its Situation, with reſpect to the inferiour Meſenteric Artery, which is alſo leſs than the ſuperiour.

SECT.

# SECT. VI.

## *A Deſcription of the Nerves.*

*Introduction.*

1. ALL the Nerves of the Human Body come originally from the Cerebrum or Cerebellum, by means of the Medulla Oblongata, or Medulla Spinalis. They go out in Bundles regularly diſpoſed in Pairs, like ſo many diſtinct Trunks, which are afterwards divided into Branches, Rami, Ramifications and Filaments.

2. THE Nerves of the Medulla Oblongata go out, for the moſt part, through the Baſis of the Cranium, at Holes ſituated according to their Diſpoſition. Thoſe of the Medulla Spinalis paſs through the lateral Foramina of all the Vertebræ, and through the great Anterior Foramina of the Os Sacrum.

3. WE commonly reckon ten Pairs of theſe Faſciculi or Nervous Trunks to the Medulla Oblongata, nine of which go out ſeparately through particular Holes of the Baſis Cranii; and the tenth, which ariſes from the Extremity of that Medulla, paſſes through the great Occipital Foramen.

4. THE Trunks from the Spinal Marrow are twenty-four Pairs, and may in general be termed Nervi Vertebrales, or Intervertebrales. Seven of them are called Cervical Nerves; twelve, Dorſal or Coſtal, being true Intercoſtal Nerves; and five, Lumbar; to which muſt be added, five or ſix Pairs that paſs out through the Os Sacrum.

5. BEFORE I enter upon the particular Diſtribution of all theſe Nerves, and the Courſe of their Branches, Ramifications and Filaments, I think it proper to give a general Idea of them in the following Table.

*Nerves of the Medulla Oblongata.*

6. THE Nerves of the Medulla Oblongata are theſe:

First Pair; Nervi Olfactorii.
Second Pair; Nervi Optici.
Third Pair; Nervi Motores Oculorum, Oculares Communes, Muſculares Communes, Oculo-Muſculares Communes.
Fourth Pair; Nervi Trochleares, Muſculares Obliqui Superiores, vulgo Pathetici.
Fifth Pair; Nervi Innominati Trigemini. The ſubordinate Trunks of this Pair are three on each ſide, *viz.* The Nervus Orbitarius, Maxillaris Superior, and Maxillaris Inferior.
Sixth Pair; Nervi Motores Externi, Oculares Externi, Muſculares Externi, Oculo-Muſculares Externi.
Seventh Pair; Nervi Auditorii, which are two on each ſide, one called Portio Mollis Nervi Auditorii; the other, Portio Dura, to which I give the name of Nervus Sympatheticus Minor.
Eighth Pair; Par Vagum Minus, which I call Nervi Sympathetici Medii.

Ninth Pair; Nervi Hypogloſſi, vulgo Guſtatorii vel Linguales.
Tenth Pair; Nervi Sub-Occipitales.

*Nerves of the Medulla Spinalis.*

7. The Nerves of the Medulla Spinalis are theſe:

One Pair called Nervi Acceſſorii of the eighth Pair from the Medulla Oblongata.

One Pair commonly called Nervi Intercoſtales, which I name Nervi Sympathetici Majores.

Seven Pairs of Nervi Cervicales, or Intervertebrales Colli.

Twelve Pairs of Nervi Dorſales, Coſtales, Intercoſtales Veri, or Intervertebrales Dorſi.

Five Pairs of Nervi Lumbares, or Intervertebrales Lumborum.

Five or ſix Pairs of Nervi Sacri.

Two Nervi Diaphragmatici, each formed by a Trunk of the ſecond, third, and fourth Pair of Cervical Nerves.

Nervi Brachiales of each ſide, formed by the fifth, ſixth, and ſeventh Pairs of Cervical Nerves, and by the firſt Pair of the Dorſales.

From theſe Nerves, ſix Branches ariſe on each ſide, *viz.*

Nervus Muſculo-Cutaneus.
Nervus Medianus.
Nervus Cubitalis.
Nervus Cutaneus Internus.
Nervus Radialis.
Nervus Axillaris, ſive Articularis.

Nervi Crurales of each ſide, formed by the firſt, ſecond, and third Pairs of the Nervi Lumbares; and partly by the fourth and fifth.

Each of theſe Nerves is divided into three Portions, which are

Nervus Femoris Cruralis, ſive Cruralis Superior.
Nervus Tibiæ Cruralis, ſive Cruralis Tibialis.
Nervus Cruralis Pedis, ſive Cruralis Pedalis.

Nervi Sciatici, each formed by the Trunks of the laſt two Pairs of the Nervi Lumbares, and by the three or four following Pairs of the Nervi Sacri.

The principal Diviſion of each of theſe Nerves produces the following:

Nervus Sciatico-Cruralis.
Nervus Sciatico-Popliteus.
Nervus Sciatico-Tibialis.
Nervus Sciatico-Peronæus.
Nervus Plantaris Internus.
Nervus Plantaris Externus.

8. I refer the Subdiviſions of the Nervi Innominati, or of the fifth Pair, and thoſe of the three Nervi Sympathetici, to the particular Deſcription, in which I ſhall trace the Branches, Ramifications, and even the moſt remarkable Filaments, all the way to where they enter the Muſcles, Viſcera, Organs, *&c.* and I ſhall purſue their Courſe ſtill further in the particular Hiſtory of each of theſe Parts.

*Nervi Olfactorii.* 9. The firſt Pair of Nerves of the Medulla Oblongata, or Nervi Olfactorii, formerly named Proceſſus Mammillares, ariſe by medullary Fibres, anteriourly and exteriourly from the Eminences of the Cerebrum, called Corpora ſtriata, between the anteriour and middle Lobes.

10. They run forward, toward the Os Ethmoides, on each ſide the Criſta Galli, in form of medullary Ropes, having a very ſlender Conſiſtence; and in this Courſe they receive ſome medullary Fibres from the anteriour Lobes of the Cerebrum.

11. They are at firſt very thin, but as they advance, they grow gradually larger and ſofter, and having reached the ſides of the Criſta without any Communication betwixt them, they ſend off a great number of Filaments, which run thro' the Holes of the Lamina Cribroſa.

12. In their paſſage through theſe Foramina, they are accompanied and inveſted by the ſame number of ſmall Productions from the two Laminæ of the Dura Mater, as by particular Vaginæ; and they are afterwards diſtributed by an infinity of ſmall Filaments to the Membrane, which lines all the internal Parts of the Noſe.

13. Each olfactory Nerve communicates by particular Filaments with ſome Branches of the Nervi Ophthalmici and Maxillaris Superior.

*Nervi Optici.* 14. The Optic Nerves ariſe from the Eminences of the Cerebrum, called Thalami Nervorum Opticorum; and being firſt of all incurvated outward, they afterwards approach each other, as they run over the Sella Sphenoidalis of the Baſis Cranii, at which place they unite a little, and afterwards ſeparate again in their paſſage to the Foramina Optica, to the Orbits, and Globe of the Eyes.

15. This Union of the Optic Nerves is on the anteriour part of the Glandula Pituitaria, and is of a very ſingular kind, as we ſhall ſee in the particular Deſcription of the Head.

*Nervi Motores Oculorum. Communes.* 16. The third Pair of Nerves, commonly called Motores Oculorum, ariſe immediately before the Border of the anteriour Edge of the great tranſverſe Protuberance, ordinarily termed the Proceſſus Annularis of the Medulla Oblongata.

17. Each Nerve perforates the Dura Mater, behind the lateral Parts of the poſteriour Apophyſis of the Sella Sphenoidalis; and afterwards runs along the upper part of the Sinus Cavernoſus of the Dura Mater, on one ſide the Curvature of the Carotid Artery, to the ſuperiour Orbitary, or Sphenoidal Fiſſure.

18. From thence it paſſes into the Orbit, and divides into four Branches, one ſuperiour, one internal, and two inferiour, one of which is long, the other ſhort.

19 The ſuperiour Branch goes off as ſoon as the Trunk enters the Sphenoidal Fiſſure, and runs directly to the lower ſide of the Muſculus Rectus ſuperior of the Globe of the Eye.

20. Having reached the middle of that Muſcle, or thereabouts, it ſends up a Ramus to the Levator Palpebræ ſuperioris; and when this Ramus goes off nearer the Sphenoidal Fiſſure, it may be looked upon as the ſecond ſuperiour principal Branch of the Motor Oculi.

21. The other three Branches go off at ſome diſtance from the ſuperiour Branch. The internal Branch is diſtributed to the Muſculus Rectus internus of the Eye; the ſhort inferiour Branch, to the Rectus inferior; and the long inferiour Branch, to the Obliquus inferior, into the Subſtance of which it penetrates, after having run along the Rectus inferior.

22. Besides theſe four or five Branches, there is a ſmall ſhort Branch, which ariſes moſt commonly from that which goes to the Muſculus Obliquus inferior; and it forms a ſmall lenticular Ganglion, that detaches ſeveral very fine Filaments round the Optic Nerve.

23. The Filaments of the Ganglion perforate the Tunica Sclerotica of the Eye, and then run between this Coat and the Choroides, all the way to the Iris, where they are diſtributed by very fine Ramifications.

24. The ſmall lenticular Ganglion produces likewiſe other nervous Filaments, which communicate with the Ramus Internus or Naſalis of the orbitary Nerve.

*Nervi Trochleares.*

25. The fourth Pair of Nerves of the Medulla Oblongata, or Nervi Trochleares, are long and ſmall, ariſing behind the Eminences called Nates, from the lateral part of the medullary Expanſion, which lies above the paſſage between the third and fourth Ventricles of the Brain.

26. From thence they go on each ſide to the Edge of the Fold formed by the Dura Mater, on the Extremity of the Apophyſis Petroſa, behind the Sella Sphenoidalis, that is, by the anteriour Portions of the Septum Tranſverſum.

27. There, each Nerve perforates the Edge of the Fold, above the Paſſage of the Nerve of the third Pair, and more backward and outward. Afterwards, it runs in the Duplicature of that Fold, on one ſide of the Nerve of the third Pair, along the upper part of the Sinus Cavernoſus, and paſſes into the Orbit through the Sphenoidal Fiſſure, and into the Muſculus Trochlearis. Its Courſe is oblique over the other Nerves and neighbouring Muſcles, and it ſends off ſmall Filaments on each ſide; appearing to communicate with the firſt Branch of the fifth Pair or Nervus Ophthalmicus.

*Nervi Trigemini.*

28. The fifth Pair of Nerves is very large, and they ariſe anteriourly from the lateral Parts of the tranſverſe Protuberance of the Medulla Oblongata, by a great number of Filaments cloſely united together, which afterwards form two large flat Trunks, one on each ſide. Each Trunk runs toward the Apex of the neighbouring Os Petroſum, where it perforates the Dura Mater, a little below the Edge of the Extremity or anteriour Portion of the Septum Tranſverſum of the Brain.

29. Having detached ſome Filaments to the Apex of the Apophyſis Petroſa, or to a kind of Seſamoide Bone, which is often found near this Apex, it enters the Sinus Cavernoſus; and having ſent ſome other Filaments to the Dura Mater, it expands in the Sinus, and forms a kind of Plexus, or flat irregular Ganglion.

30. Afterwards, the Trunk is divided into three large Branches more or leſs flatted, which run through the Cavernous Sinus, being cloſely connected to the ſpungy Filaments thereof, and bathed in the venal Blood, which it contains. Theſe three Branches are diſpoſed laterally on one Vertical Plane, and ſeparate after the manner of a Gooſe's Foot.

31. The firſt Branch commonly called Nervus Ophthalmicus Williſii, is the ſmalleſt and longeſt of the three, and enters the Orbit through the Sphenoidal Fiſſure; for which reaſon I name it Nervus Orbitarius.

32. The ſecond or middle Branch, called alſo Nervus Maxillaris ſuperior, paſſes through the ſuperior maxillary Foramen of the Os Sphenoides.

33. The third or inferiour Branch, called likewiſe Nervus Maxillaris inferior, goes down through the Foramen Ovale or Maxillare inferius of the ſphenoidal Bone. The two maxillary Nerves are united at their Origin, for which reaſon, ſome Anatomiſts have divided the large Trunk into two principal Branches; and the ſecond of theſe Branches, into two others.

*Nervus Orbitarius vulgo Ophthalmicus.*

34. The Orbitary or Ophthalmic Nerve, which is the firſt Branch of the fifth Pair, as ſoon as it enters the Orbit, through the ſphenoidal Fiſſure, is divided into three Rami, one ſuperiour or frontal, one internal or naſal, and one external or lacrymal; and before its Entry, it ſometimes gives and ſometimes receives communicating Branches. It communicates by a Filament or two with the Nerve of the ſixth Part, and with the Nerve commonly called Intercoſtalis.

35. The Ramus Superior or Frontalis, which might likewiſe be termed Nervus Superciliaris, is the moſt conſiderable of the three, and runs along the ſuperiour Part of the Orbit cloſe to the Membrane which lines it, ſending Filaments to the Fat which ſurrounds the Globe of the Eye, to the neighbouring Membranes, and to the Muſculus Levator Palpebræ.

36. Afterwards it paſſes through the Foramen Superciliare, and being divided toward each ſide, it is ſpent on the neighbouring Portions of the Muſculus Frontalis, Orbicularis and Integuments; communicating with a neighbouring Ramus of the Portio Dura of the Auditory Nerve.

37. The Ramus Internus or Naſalis of the Orbitary Nerve, runs toward the Noſe; and near its Origin ſends off a Filament, which communicates with the ſmall lenticular Ganglion already mentioned.

38. This Filament comes ſometimes from the Trunk of the orbitary Nerve before the Diviſion, and adheres to the internal Ramus all the way to where the Motor Communis is divided.

39. This Naſal Ramus runs firſt of all, obliquely over the Optic Nerve, and under the two Muſculi Levatores, giving off ſome Filaments to the neareſt Parts of theſe Muſcles. Afterwards it runs between the Muſculus Rectus internus and Obliquus major, along the inſide of the Orbit; and

in its paſſage ſends a ſmall Filament through the internal orbitary Hole, of which hereafter.

40. From thence it paſſes over the Muſculus Rectus internus, to the great or internal Angle of the Eye, where it is diſtributed to the neighbouring Parts, that is, to the Caruncula and Sacculus Lacrymalis, to the neareſt Portions of the Muſculus Orbicularis, Superciliaris, Pyramidalis Naſi, and to the Integuments.

41. The ſmall lateral Filament which it ſends through the orbitary Hole, returns into the Cranium, running up from before, backward, on one ſide of the Os Cribroſum, and having reached the Fore-part of the Duplicature of the Dura Mater, it joins the Filaments of the Olfactory Nerve, on the Lamina Cribroſa, together with which it paſſes through the anteriour Holes of that Lamina, and is diſtributed to the Noſe.

42. The Ramus Externus or Lacrymalis goes chiefly to the Glandula Lacrymalis, upon which it is diſtributed, and from whence it has its Name. It ſeems ſometimes to be a Branch from the Ramus Frontalis, and it often ariſes from the Orbitary Nerve more poſteriourly than the other Branches. It adheres cloſely to the Dura Mater, and runs obliquely along the inſide of the Orbit, on the Muſculus Rectus Externus, to the Glandula Lacrymalis.

43. Before it reaches the Gland, it ſends a ſmall Branch to the external lateral Part of the Orbit, which is ſometimes loſt in the Diploë of the Cranium, and ſometimes perforates the neighbouring Part, either of the Os Frontis, or Os Malæ, *&c.* ſending Filaments to the neareſt Portions of the Muſculus Temporalis, Orbicularis Palpebrarum, Maſſeter, *&c.* and of the Integuments; and it likewiſe gives Filaments to the Fat and Membrana Conjunctiva of the Eye.

*Nervus Maxillaris Superior.*

44. The ſuperiour maxillary Nerve, the ſecond Branch of the fifth Pair, goes out of the Cranium between the Foramen Ovale and Fiſſure of the Os Sphenoidale, paſſing through the Foramen Rotundum or Maxillare Superius of the ſame Bone.

45. Immediately after its paſſage, it ſends a Filament to the outſide of the Orbit, which having perforated the Os Malæ, is diſtributed to the Parts which cover that Bone, communicates with a neighbouring Branch of the Portio Dura of the Auditory Nerve; and ſends ſmall Filaments to the Fat in the lower Part of the Orbit.

46. Soon afterwards, it is divided into three Rami, the firſt of which I name Suborbitarius, the ſecond, Palatinus, and the third, Spheno-Palatinus, which laſt is ſometimes only a Branch of the firſt; but ſtill the common Diviſion may be retained.

47. The Sub-Orbitary Ramus, is the moſt conſiderable of the three. It runs in the Canal of the inferiour Portion of the Orbit, and goes out by the exteriour orbitary Hole, which is ſometimes double.

48. In this paſſage it ſends downward through the Holes of the Canal, ſmall Filaments which enter the Sinus Maxillaris, and are diſtributed to the Membrana Pituitaria in that Sinus, to the Subſtance of the Bone, to the

Alveoli, to the anterior Dentes Molares, and to the Dentes Canini and Inciſores.

49. As it enters the Canal, it ſometimes gives off a Filament to the poſterior Molares; and among all theſe Filaments there is at leaſt one, which runs along the upper ſide of the Arch of the Palate, to the Union of the Oſſa Maxillaria.

50. This Ramus having paſſed out of the bony Canal, through the Foramen Sub Orbitarium Anterius, is diſtributed to the Muſculus Orbicularis Palpebrarum, to the neighbouring Muſcles of the Noſe and Lips, and to the Integuments; communicating with a Ramus of the Portio Dura of the Auditory Nerve.

51. The Ramus Palatinus of the ſuperiour maxillary Nerve runs down before the Pterygoide Apophyſes of the Os Sphenoides, in the Canal formed by the Os Maxillare and Os Palati; and having paſſed out of that Canal, through the Foramen Palatinum poſterius, it is diſtributed by ſeveral Filaments to the Glandular Coat of the Palate, to the Septum Palati, and Muſcles belonging to that Part. Some of theſe Filaments go as far as the Foramen Palatinum Anterius or Inciſorium.

52. As it runs down in the Canal, it is at firſt a little bent, and then ſends Filaments to the Muſculus Pterygoidæus Externus, to the Peri-Staphylini, and to the Arch of the Pharynx. It likewiſe ſends other Filaments through the ſmall Holes in the poſteriour Part or Tubercle of the Os Maxillare, to the Sinus Maxillaris and poſterior Dentes Molares.

53. The Ramus Spheno-Palatinus paſſes through the bony Hole of the ſame Name, and is diſtributed to the Muſculus Pteryoidæus Internus, to the poſteriour Parts of the Nares, to the neighbouring Sinus Sphenoidalis, and to the Tuba Euſtachiana.

54. It likewiſe ſends a Filament through the Foramen Pterygoides, which perforates the Root of the Apophyſis Pterygoides from behind forward, and joins the Nervus Maxillaris inferior.

*Nervus Maxillaris Inferior.*

55. The inferiour maxillary Nerve, the third Branch of the fifth Pair, is larger at its Origin, than the other two. It goes out of the Cranium by the Foramen Ovale of the Sphenoidal Bone, and runs between the two Muſculi Pterygoidæi, below the great Sinus of the lower Jaw, where it enters the bony Canal of that Jaw.

56. As ſoon as it leaves the Cranium, it ſends off four principal Branches, and before it enters the Canal of the lower Jaw, it gives off another to the Tongue. The four firſt Branches ariſe very near each other, ſo that the Size of this Nerve decreaſes very much between the Muſculi Pterygoidæi.

57. The firſt Branch of this Trunk runs up to the Temporal Muſcle, on the inſide of which it is diſtributed, and alſo between its Fibres.

58. The ſecond Branch runs behind the Condyle of the lower Jaw, where it divides into two Filaments, which run from within, outward, and communicate with the neighbouring Ramus of the Portio Dura of the Auditory Nerve, behind the outſide of the Condyle.

59. At the Origin of theſe two Filaments, it ſends off a ſmall Ramus, which runs up before the external Ear toward the Temples, giving Filaments to the Concha of the Ear in its paſſage.

60. The Ramus of this Trunk paſſes between the two Apophyſes of the lower Jaw, perforates the lower part of the Temporal Muſcle, and gives it ſeveral Filaments.

61. Afterwards it bends downward upon the Muſculus Maſſeter, to which it is chiefly diſtributed, giving Filaments to the neighbouring Integuments, and communicating with the Portio Dura of the Auditory Nerve, on the ſide of the Os Malæ. It terminates by Filaments which go to the Muſculus Buccinator, to the Muſcles of the Under Lip, and to the Integuments of theſe Parts.

62. The fourth Branch of the Trunk of the inferiour maxillary Nerve, is oftentimes no more than a Ramus of the third Branch, which goes off near its Origin. It paſſes over the Muſculus Pterygoidæus Externus, to which it gives Filaments, and is diſtributed to the Pterygoidæus Internus, and to the neareſt Portion of the Temporalis.

63. It is likewiſe diſtributed to the Muſculus Buccinator, to the Glands of the Mouth and Muſcles of the Lips. Sometimes it ſends off a Filament, which runs up upon the Concha of the external Ear.

64. Besides theſe four Branches, ſeveral ſmall Filaments go off on each ſide, one of which runs to the Foramen Pterygoidæum, where it joins a Filament of the Nervus Maxillaris Superior, and then continues its Courſe to the Membrane which covers the Vomer and neighbouring Parts of the internal Nares.

65. The Ramus that goes to the Tongue, which may be termed Nervus Lingualis or Hypogloſſus Minor, to diſtingniſh it from the Hypogloſſus Major, which belongs to the ninth Pair, is detached from the Maxillaris Inferior, as it paſſes between the Muſculi Pterygoidæi, and ſometimes a little ſooner.

66. It is a very conſiderable Branch, and ſometimes nearly as large as the Trunk which it accompanies between the two Muſcles already mentioned, and leaving it a little above the Canal of the lower Jaw, it runs over the Pterygoidæus Internus, and gives it ſome Filaments.

67. This Ramus Lingualis, a little after its Origin, communicates with the Trunk by a ſhort collateral Branch which is ſometimes Plexiform. At this place it ſuſtains a particular Filament, which according to the common Opinion ariſes from it, and goes to the internal Ear.

68. This particular Filament of the Nervus Lingualis is ſuppoſed by Anatomiſts, to be a Recurrent which runs up backward through the Tympanum, and joins the Portio Dura of the Auditory Nerve. But as the Angle which it makes with the ſmall Nervus Lingualis, is very acute and turn'd forward, there is more reaſon to think that it comes from the internal Ear to that Nerve, as we ſhall ſee more at length in the Deſcription of that Organ.

69. Afterwards this Lingual Ramus paſſes under the lateral part of the Tongue, and over the Glandula Sublingualis, giving Filaments to the

neighbouring Portions of the Muſcles of the Tongue, and to thoſe of the Os Hyoides and Pharynx.

70. Having communicated by ſeveral Filaments, with the Extremities of the Nerve of the ninth Pair, or Lingualis Major, it enters the Subſtance of the Tongue, and terminates near its Apex or Point.

71. Lastly, the inferiour maxillary Nerve, before it enters the Canal of the lower Jaw, ſends Filaments to the neighbouring Portions of the Muſculus Pterygoidæus Internus, Digaſtricus, *&c.* It likewiſe detaches a Filament or two along the Perioſteum, to be diſtributed to the Muſculus Mylo-Hyoidæus, and Glandula Sublingualis. The Marks of theſe Filaments often appear upon the Bone, all the way from their Origin, and ſometimes they paſs through a ſmall intire bony Canal, lying on the Surface of the inſide of the Bone.

72. After the inferiour maxillary Nerve enters the Canal of the lower Jaw, it runs under the Alveoli, and diſtributes Filaments to each Tooth, all the way to the Hole near the Chin, where it ſends another Ramus forward, into the Diploë, which is diſtributed to the other Teeth, that lie between that Hole and the Symphyſis of the Chin.

*Nervi Motores Externi.*

73. The Motores Externi, which make up the ſixth Pair of Nerves from the Head, are ſmaller, but yet a little larger than thoſe of the fourth Pair. They ariſe from the Union of the Medulla Oblongata, between the great tranſverſe Protuberance, and the Corpora Olivaria; from whence they advance to the Dura Mater, and enter it on the Extremity of the Production of the Os Occipitis behind, and a little on one ſide of the Symphyſis of that Bone with the Os Sphenoides.

74. Each of theſe Nerves runs afterwards in the Cavernous Duplicature of the Dura Mater, on one ſide of the Bottom of the Sella Sphenoidalis, and of the Carotid Artery, to which it adheres very cloſely, and it there communicates with a Branch of the fifth Pair, by one or two ſhort Filaments, as has been already ſaid in the Deſcription of the Orbitary Nerve.

75. Immediately after, and behind this Communication, the Motor externus ſends down a Filament, which at firſt appears to run from before, backward, like a Recurrent, and preſently enters the large Bony Canal of the Apophyſis Petroſa, on one ſide of the internal Carotid Artery.

76. This Nervous Filament, which is ſometimes double, is commonly taken for the Root or Origin of the celebrated Intercoſtal Nerve, which I term Sympatheticus Major; but as it makes an acute Angle in an oppoſite Direction, with the Nerve of the ſixth Pair, it ſeems rather to run up with the Carotid Artery, and to join that Nerve, than to ariſe from it. The Progreſs of this Nerve ſhall be continued in the Deſcription of the great Sympatheticus.

77. The Nerve of the ſixth Pair, which I have ſometimes ſeen double or ſplit in two Parts, before it enters the Dura Mater, paſſes afterwards thro' the Sphenoidal or Superiour Orbitary Fiſſure, to the Muſculus Rectus Externus of the Globe of the Eye.

*Nervi Auditorii.*

78. The Nerves of the ſeventh Pair, termed Auditorii, ariſe from the lateral and poſteriour part of the great tranſverſe Protuberance of the Medulla Oblongata. Each of theſe Nerves is double, or conſiſts of two Ropes, which accompany each other very cloſely to the Foramen Auditorium Internum of the Apophyſis Petroſa.

79. One of theſe Ropes is ſmall, ſolid and anteriour, being called the Portio Dura; the other leſs ſolid and poſteriour, called Portio Mollis.

80. The Portio Mollis terminates in the great Foſſula of the Foramen Auditorium Internum, and is diſtributed to the Organ of Hearing through ſeveral other ſmall Holes. This Portion alone deſerves the name of the Auditory Nerve; but the particular Deſcription thereof muſt be referred to that of the Ear.

81. The Portio Dura paſſes through the ſmall Foſſula of the internal auditory Hole, into the winding Duct of the Apophyſis Petroſa, and goes out by the Foramen Stylo-Maſtoidæum, to the Face and other neighbouring Parts. As it paſſes through the winding Duct or Aqueduct of Falloppius, it touches the Dura Mater at the ſmall opening on the upper ſide of the Apophyſis Petroſa, where it joins ſome Filaments from the fifth Pair.

82. It likewiſe gives off a Filament to the Muſcle of the Stapes; and as it goes out, it gives or receives another Filament which paſſes by the Tympanum, and joins the Ramus Lingualis of the inferiour Maxillary Nerve, as we ſhall ſee more particularly in the Hiſtory of the Ear.

83. I choose to call this Portion of the Auditory Nerve, Nervus Sympatheticus Minor; to the Deſcription of which I now proceed.

*Nervi Sympathetici Minores.*

84. The Trunk of each Nerve of the Portio Dura, or of the Sympathetici Minores, having paſſed through the Ductus Petroſus Falloppii, and having communicated with the Dura Mater, *&c.* as has been already ſaid, ſends off, at about the ſixth part of an Inch from where it goes out at the Stylo-Maſtoide Hole, two Branches, one upward, the other downward.

85. The ſuperiour Ramus runs up chiefly to the poſteriour parts of the external Ear, to which it is diſtributed; communicating, as it paſſes behind the Ear, with a Ramus of the ſecond Pair of the Cervical Nerves; and forward, with a Branch of the Maxillaris Inferior.

86. The inferiour Ramus is ſpent on the three Muſculi Styloidæi, Digaſtricus, and on the ſuperiour Extremity of the Sterno-Maſtoidæus, reaching in ſome Subjects as far as the middle of that Muſcle. In place of theſe two ſingle Rami, ſmall Ramifications go out ſometimes from the Trunk.

87. Afterwards the Trunk of the Portio Dura advances forward, through the Parotid Gland, to which it gives ſeveral Filaments; ſome of theſe Filaments running from without inwards, and ſurrounding that Branch of the external Carotid Artery, which runs behind the Ear. Sometimes, tho' very ſeldom, the Trunk itſelf is ſplit to give paſſage to the Artery.

88. This Trunk having paſſed through the Parotid Gland, behind the Angle of the lower Jaw, is divided into two large Branches, one ſuperiour, the other inferiour.

89. The ſuperiour Branch of the Portio Dura is the moſt conſiderable of the two; and having run upwards for about the third part of an Inch, it divides into ſeven or eight Rami.

90. These Rami are ſpread ſuperficially, and in an irregular radiated manner, on all the lateral parts of the Face, from the Hair as low as the Under Lip, between the Ear and Noſe; diſtributing a prodigious number of Cutaneous Nerves.

91. In ſome Subjects theſe Rami, at their firſt ſeparation, form a kind of Plexus which reſembles a Gooſe's Foot.

92. The firſt, ſecond, and third Rami are diſtributed to the anteriour part of the Ear, on the lateral parts of the Head, the temporal and frontal Muſcles, and the neighbouring parts.

93. One of theſe Rami, and ſometimes the large ſuperiour Branch, detaches inward behind the Condyle of the lower Jaw, and before the temporal Vein, two or three Filaments which communicate with the inferiour Maxillary Nerve.

94. The fourth Ramus goes to the Foramen Superciliare, or Supra-Orbitarium, giving in its paſſage, ſeveral Filaments to the external lateral and ſuperiour parts of the Muſculus Orbicularis Palpebrarum; and afterwards communicating with the Orbitary Nerve, which goes out by the ſaid Foramen.

95. The fifth Ramus is diſtributed by ſmall Filaments on the lateral part of the Cheek, and is partly loſt in ſome ſmall Holes at the Baſis or Root of the Zygoma; giving likewiſe ſome Filaments to the external lower part of the Muſculus Orbicularis Palpebrarum.

96. The ſixth and ſeventh Rami, and likewiſe the eighth when it is found, are ſpread on the whole Cheek as far asthe Noſe.

97. One of theſe latter Rami paſſes under or behind the Muſculus Zygomaticus, to which it gives Filaments; and then perforating and giving Filaments to the middle lower part of the Muſculus Orbicularis Palpebrarum, it goes to the inferiour Orbitary Hole in the Os Maxillare, and communicates with the Nervus Maxillaris Superior.

98. The laſt Ramus communicates by ſome Filaments, with a neighbouring Ramus of the large inferiour Branch of the Portio Dura.

99. This large inferiour Branch, which is ſomething leſs than the ſuperiour, runs under the Angle of the lower Jaw, and is diſtributed by ſeveral Rami to all the inferiour lateral parts of the Face, and to the neighbouring parts of the Throat, where it chiefly terminates by a vaſt number of Cutaneous Filaments.

100. The upper Rami of the large inferiour Branch run up on the Muſculus Maſſeter, to the lower part of the Zygomaticus, Buccinator, and other Muſcles of the Lips.

101. One of theſe ſuperiour Rami communicates with one of the inferiour Rami of the upper Branch, as has been already ſaid; and by the Intervention thereof, it communicates likewiſe in ſome meaſure with the Sub-Orbitary Ramus of the Nervus Maxillaris Superior, or that which goes out by the Foramen Sub-Orbitarium.

102. The moſt conſiderable of all theſe Rami, runs forward along the Baſis of the lower Jaw, ſending Filaments to the Muſculus Cutaneus, and to the Muſcles of the Under Lip, which it perforates near the Chin, and there communicates with the Nervus Maxillaris Inferior.

103. The inferiour Rami run under the lower Jaw giving Filaments to the Glandula Sub-Maxillaris, and is diſtributed to the Throat on the Muſculus Cutaneus, interſecting the external Jugular Vein. One or more of theſe Rami are obſerved to run down to the middle of the Muſculus Sterno-Maſtoidæus, where it communicates with a Ramus of the ſecond Vertebral Pair.

*Nervi Sympathetici Medii.*

104. The Nerves of the eighth Pair, called by the Ancients Par Vagum, and which I have named Nervi Sympathetici Medii, ariſe from the poſteriour part of the Medulla Oblongata, from the great tranſverſe Protuberance, and from the anteriour part of the Corpora Olivaria, by ſeveral ſeparate Filaments which are afterwards collected in a Faſciculus, that runs toward the anteriour part of the Foramen Lacerum of the Baſis Cranii, where it perforates the Dura Mater immediately before the Extremity of the great lateral Sinus.

105. The paſſage of this Nerve is divided from that of the Sinus, by a ſmall Membranous Septum of the Dura Mater, and by the little bony Prominences of the Foramen Lacerum, mentioned in the Deſcription of the Sceleton.

106. This great Faſciculus does not penetrate the Dura Mater through a ſingle Opening, and as one Rope; for ſeveral of the anteriour Filaments form a particular Portion, divided from the main Body by a very thin membranous Septum.

107. The Filaments which compoſe the large Portion, when carefully examined, ſeem to perforate the Dura Mater ſeparately, by ſmall Holes or Pores, which lie very near each other.

108. Tho' theſe two Portions go out ſeparately, they are look'd upon as a common Trunk; and the ſmall Portion is look'd upon as a Branch of the great one, which lies behind the other, and is eſteemed the true Trunk of this eighth Nerve.

109. As this Trunk goes out, it receives backward a ſmall nervous Rope, which runs up laterally from the Spinal Canal, and paſſing through the great Occipital Hole on the Dura Mater, joins this Trunk. This ſmall Rope is termed Nervus Acceſſorius Octavi Paris, or Nervus Spinalis.

110. As the two Portions paſs through the Dura Mater and Foramen Lacerum, they are cloſely united together, and communicate by Filaments which increaſe the Size of the ſmall Portion. The large Portion communicates likewiſe with the Nervus Acceſſorius, to which it is ſtrongly connected during this paſſage.

111. The ſmall or anteriour Portion having paſſed out of the Cranium, ſeparates from the large one as a Branch from a Trunk; and from thence it has been called the firſt Branch of the eighth Pair.

112. It is bent in form of an Arch, and paſſing interiourly on the ſide of the Digaſtric Muſcle, it ſupplies the Muſculi Genio-Hyoidæi, thoſe near the Baſis of the Tongue, and thoſe of the Pharynx.

113. About two Fingers breadth from where it leaves the Cranium, this Portion ſends backward, one Ramus which is bent in the ſame Direction like an inverted Arch; and detaches from its convex ſide, at leaſt three Filaments. The firſt, which is ſometimes double, communicates with the Trunk of this eighth Pair, on one ſide of the Ganglion of the Intercoſtal or great Sympathetic Nerve. The ſecond joins the Nervus Acceſſorius, and the third goes to the Pharynx.

114. Afterwards this ſmall Portion goes to the Tongue, as has been ſaid, where it communicates with the Extremities of the ſmall Nervus Hypogloſſus, or Ramus Lingualis of the inferior Maxillary Nerve, and with thoſe of the great Hypogloſſus or Nerve of the ninth Pair.

115. The large Portion of the eighth Pair, or middle Sympathetic Nerve, adhering by one ſide to the firſt Ganglion of the Sympatheticus Maximus, and by the other, to the Hypogloſſus Major, to both which it gives communicating Filaments, ſends off a little below the ſmall Portion, another ſmaller Branch, which goes by ſeveral Filaments to the Pharynx.

116. A little below, or on one ſide of the Union of the eighth Pair with the ninth, this Portion or Trunk forms a Ganglion, and gives off a third Branch, which runs before the internal Carotid Artery, to the Larynx, Muſculi Laryngis, Glandula Thyroides, and Muſcles of the Os Hyoides.

117. This third Branch paſſes between the Cornu of the Os Hyoides and the Ala of the Cartilago Thyroides, and running in between that Cartilage and the Cartilago Cricoides, it communicates with the Extremities of the Nervus Recurrens, of which hereafter.

118. Afterwards, the large Trunk runs down on the fore ſide of the firſt Ganglion of the Nervus Sympatheticus Maximus, along the anteriour Vertebral Muſcles of the Neck, by the ſide of the Carotid Artery, and behind the internal Jugular Vein; being accompanied by the Intercoſtal Nerve as far as the laſt Vertebra of the Neck.

119. Through all this Courſe, this Trunk is inveſted by a kind of Cellular, Filamentous, or Membranous Vagina, common to it with the internal Carotid Artery, the internal Jugular Vein, and the great Sympathetic Nerve. In its Paſſage it gives ſmall Rami to the neighbouring Parts, to the Pharynx, Œſophagus, and to the Carotid Artery and Jugular Vein. One of theſe ſmall Rami, in its courſe downward, joins a ſmall Ramus of the ſecond Cervical Pair, and is diſtributed to the Glandula Thyroides.

120. The Trunk having reached as low as the Larynx and Glandula Thyroides, ſends out a Ramus, which running down on the fore-ſide of the internal Carotid Artery, joins a Filament from the ſecond Ganglion of the Intercoſtal Nerve, with which it runs to the Plexus Pulmonaris.

121. Afterwards, both Trunks of the Nerves of the eighth Pair enter the Thorax, before the Origin of the Subclavian Arteries, which they croſs, and run behind the Lungs, to the Œſophagus. At this Place there is ſome

difference in the diſtribution of the two Trunks, which in every other reſpect is pretty much the ſame.

122. As the right Trunk paſſes before the ſubclavian Artery, it ſends off a conſiderable Branch which bends backward under the Artery, and runs up on one ſide of the Aſpera Arteria; to which, and to the Œſophagus, it ſends Filaments as high as the Larynx. This Branch is called Nervus Recurrens.

123. This Recurrent Nerve having reached the Larynx, ſends Rami to the Muſcles thereof, to the Pharynx and Glandula Thyroides. Then it runs in behind the Cornua of the Cartilago Thyroides, where it joins the Extremity of the third Branch of the Trunk of this eighth Pair, communicating with it in the manner already ſaid.

124. The right Trunk having given off the Recurrent of the ſame ſide, runs down on one ſide of the Aſpera Arteria, and behind the Origin of the right Lung, where it adheres to the Œſophagus; and in this courſe it ſends out ſeveral Branches.

125. The uppermoſt Branches run on the fore-ſide of the lower Extremity of the Aſpera Arteria and Bronchia, and are all united to Filaments of the great Sympathetic Nerve, before the Bifurcation of the Trachea, and likewiſe to the Ramifications of the ſame Nerve from the other ſide. The other Branches which the Trunk ſends off, as it runs down behind the Bronchia and Lungs, unite with Filaments of the great Sympathetic Nerve.

126. The left Trunk of the eighth Pair is ramified in the Thorax, much in the ſame manner with that of the right ſide, with this difference only, that the left Recurrent Nerve goes out lower than the right; for it paſſes below the great Curvature of the Aorta, and behind the Ductus or Ligamentum Arterioſum, and afterwards runs up on one ſide of the Trachea Arteria, to the Larynx much in the ſame manner with the other.

127. This difference in the going off of the two Recurrents, is the reaſon why the left Trunk does not run down ſo ſtreight as the right; and the left Recurrent gives off ſome of the Branches, which anſwer to thoſe which come from the Trunk itſelf on the right ſide.

128. Immediately after the Origin of the left Recurrent, the left Trunk ſends down a Branch which goes partly to the Plexus Pulmonaris, and partly to the Œſophagus and Aorta.

129, These reciprocal Ramifications of both Trunks of the eighth Pair, and their mutual Communications with the Filaments of the Intercoſtal or great Sympathetic Nerve, of which preſently, form particular Intertextures called Plexus; the moſt conſiderable of which are thoſe called Plexus Cardiacus, and Plexus Pulmonaris.

130. The Plexus Cardiacus is formed above the Lung, on the fore ſide of the Bronchia, and produces a great number of Filaments; ſome of which go to the Pericardium, and the reſt go through it, round the great Veſſels, to be diſtributed to the Heart.

131. The Plexus Pulmonaris is compoſed of the following Ramifications which the two Trunks ſend off, as they run down behind the Lungs. Some

of the Filaments detached from thence, run above the Bronchia at their Origin; but the greateſt part run below, being diſtributed along with them thro' the whole Lungs.

132. Besides theſe Plexus, the two Trunks give off Rami to the Parts near which they paſs; ſuch as the poſteriour part of the Mediaſtinum, Œſophagus, and Aorta; and by all theſe Ramifications the Trunks are gradually diminiſhed.

133. After having ſent off the two Plexus, theſe Trunks change in a very remarkable manner. The Trunk on the right ſide runs inſenſibly backward, as it deſcends, and that on the left ſide, forward in the ſame manner.

134. In their paſſage, they ſend ſeveral Filaments forward and backward to the Œſophagus, which unite at different diſtances, both with the Filaments from the ſame Trunk, and with the like Filaments from the Trunk on the other ſide; and the poſteriour Filaments from the left Trunk, are in ſome Subjects more conſiderable than the anteriour ones from the right Trunk.

135. These repeated Diviſions and Re-unions which repreſent a kind of Plexus, cauſe the original Trunks to degenerate in ſome meaſure, into two particular Ropes, one anteriour, the other poſteriour, which are called Nervi Stomachici.

136. The poſteriour Stomachic Nerve ariſes principally from the right Trunk, and the anteriour, from the left Trunk; and accordingly the poſteriour Rope is oftentimes much ſtronger than the anteriour, becauſe of the difference between the Filaments, of which each of them is made up.

137. These two Stomachic Ropes paſs along with the Extremity of the Œſophagus, through the Opening in the ſmall Muſcle of the Diaphragm, and are diſtributed on the Stomach. The anteriour Rope is ſpread on the upper, or as it is commonly called, the fore-ſide, and the poſteriour, on the lower or backſide.

138. The Ramifications of both Ropes communicate with each other, and form particular Intertextures chiefly near the upper Orifice of the Stomach, and along the ſmall Curvature, all the way to the Pylorus; by all which a kind of Plexus is formed, called Coronarius Stomachicus.

139. This Coronary Plexus thus formed, ſends off near its Origin two ſmall Ropes; one of which ſeems to come chiefly from the great anteriour Stomachic Rope, the other from the poſteriour Rope. Theſe two ſmall Ropes unite near the Trunk of the Hepatic Artery, which having accompanied for a little way, they are divided into two very ſhort Branches.

140. These two Branches run preſently afterwards to the right and left hands, immediately above the tranſverſe Rope, which forms the Communication between the ſemi-lunar Ganglions of the two great Sympathetic Nerves; and they terminate by uniting with this Rope in a triangular Form.

141. In this manner end the Nerves of the eighth Pair, or the Sympatheticus Medius of each ſide, by contributing together with the Sympatheticus Maximus, to the Formation of ſeveral Plexus in the Abdomen, which

are aſcribed principally to the laſt named Nerve. Among theſe, are the Plexus Hepaticus, Splenicus, Meſenterici, and even the Renales.

142. We ſee likewiſe that theſe two great Pairs of Nerves have a perpetual Correſpondence through all the Viſcera of the Abdomen, as well as in the Thorax, as we ſhall ſhow more particularly hereafter.

*Nervi Acceſſorii Octavi Paris.*

143. The Nervi Acceſſorii of the eighth Pair ariſe by ſeveral Filaments from both ſides of the Medulla Spinalis of the Neck, ſometimes higher, and ſometimes lower. Each of them runs up between the two nervous Planes which come out from the ſpinal Marrow, to form the Vertebral Nerves, and they gradually increaſe in their courſe upwards by means of ſeveral Filaments which they receive from the poſteriour nervous Planes.

144. Having reached above the firſt Vertebra, each Nerve is fixed to the backſide of the Ganglion of the Nervus Sub-Occipitalis, or that of the tenth Pair; and having at the upper part of this Adheſion, received two Filaments from the poſteriour Portion of the Medulla, they part from the Ganglion, and continue their courſe upward. I have ſometimes found theſe two Filaments without any Communication with the Ganglion, or with the anteriour Plane; ſo that they ſeem rather to belong to the Nervus Acceſſorius, than to the Sub-Occipitalis.

145. They enter the Cranium by the great Occipital Foramen; and having communicated with the Origin of the Sub-Occipitalis, or Nerves of the tenth Pair, and with the great Hypogloſſi or ninth Pair, they return out of the Cranium with the Nerves of the eighth Pair, or Sympathetici Medii, with which they communicate in their common paſſage through the Cranium.

146. As ſoon as they get without the Cranium, each of them gives off a conſiderable Branch, which divides into two. One is very ſhort, and immediately joins the Trunk of the eighth Pair; the other, which is longer, joins the ſmall Portion or firſt Branch, which goes to the Tongue. They likewiſe communicate with the great Hypogloſſus and Sympatheticus on each ſide.

147. Afterwards the Nervus Acceſſorius runs backward, and perforating the Muſculus Sterno-Maſtoidæus, runs to the Trapezius, on which it is diſtributed, and terminates after having ſupplied the Rhomboides. In this courſe, it communicates with the firſt three Pairs of the Cervical Nerves, and gives Rami to the Glands of the Neck, to the Muſculus Angularis of the Scapula, the Complexus, Occipitalis, and to the Integuments.

*Nervi Hypogloſſi Externi, ſive Majores.*

148. The ninth Pair of Nerves, as they are commonly called, or the Par Linguale, ariſes on each ſide, between the Corpora Pyramidalia and Olivaria, by ſeveral ſmall Filaments which uniting together, form ordinarily two ſmall Ropes on each ſide. Theſe two Ropes perforate the Dura Mater, by two ſmall ſeparate Holes, and afterwards ſoon unite in one Trunk on each ſide, which goes out of the Cranium, by the anteriour Condyloide Hole of the Os Occipitis.

149. As ſoon as they leave the Cranium, each Trunk adheres very cloſely to the outſide of the Trunk of the eighth Pair, and to that of the tenth. From thence each Nerve paſſes on the foreſide of the large Ganglion of the Sympatheticus Maximus, and runs between the internal Jugular Vein, and the neighbouring Carotid Artery, and then to the Tongue on one ſide of the Digaſtric Muſcle.

150. In its paſſage between the Jugular and Carotid, it ſends down a Branch to the Jugular Glands, Muſculus Cutaneus, *&c.* and behind the firſt Ganglion of the Intercoſtalis, it detaches another, which runs down till it joins the Nerve of the eighth Pair, or Sympatheticus Medius. A little afterwards, it gives off a third to the Muſculus Omo-Hyoidæus, Sterno-Hyoidæus, and to the ſmall Muſcles of the Larynx.

151. Afterwards this Trunk of the ninth Pair bends near the Angle of the lower Jaw, and runs forward between the Muſculus Cerato-Baſio-Gloſſus and Mylo-Hyoidæus, under the Genio-Gloſſus; to all which Muſcles it gives Filaments, and it is afterwards loſt in the Tongue, communicating with the Filament of the Ramus Lingualis of the inferiour maxillary Nerve, and with the Ramus of the ſame Name, belonging to the eighth Pair.

152. Before it bends near the Angle of the lower Jaw, a little below the Apophyſis Styloides of the Os Temporis, it communicates with the firſt Cervical Pair, and then ſends a ſmall Ramus to the Larynx, and another more conſiderable one, which runs down behind the Muſculus Sterno-Maſtoidæus, on the anteriour Muſcles of the Neck, and communicates with the firſt and ſecond Vertebral Pairs.

153. This laſt Ramus communicates likewiſe with the Portio Dura of the Auditory Nerve, and with the following Vertebral Pairs; after which it terminates chiefly in the Muſculus Sterno-Hyoidæus, and Sterno-Thyroidæus.

154. The Sub-Occipital Nerves, or thoſe of the tenth Pair, ariſe a little lower, and more laterally than the former, at the Extremity of the Medulla Oblongata, oppoſite to the poſteriour Part of the Condyloide Apophyſes of the Os Occipitis. *Nervi Sub-Occipitales.*

155. They come on each ſide from the anteriour Part of the Medulla, by a ſingle Plane of ſmall Filaments, and communicate by ſome collateral Filaments, with the firſt Cervical Pair, before they pierce the Dura Mater.

156. They pierce the Dura Mater directly outward, oppoſite to their Origin, at the ſame place where the Vertebral Arteries perforate it inwards; both going in a manner, through the ſame Holes, and the Nerves lying below the Arteries.

157. Afterwards they run down in the Duplicature of the Dura Mater, and emerge again under the Edge of the great Occipital Foramen, croſſing the Elongation or Occipital Funnel of that Membrane.

158. Having paſſed out of the Cranium, each of them runs to the poſteriour Notch of the ſuperiour oblique Apophyſis of the firſt Vertebra of the

Neck, in which it runs from behind forwards, in company with the vertebral Artery, which lies above it in the ſame Notch.

159. Where it leaves this Notch, it forms a Ganglion, and gives Filaments to the Muſculi Recti and Obliqui of the Head, beſides one which runs down in the tranſverſe Foramina of the Vertebræ of the Neck, along the Blood-Veſſels which lie there.

160. Having formed this Ganglion, and ſent off theſe Filaments, it turns forward and downward over the tranſverſe Apophyſis of the firſt Vertebra, forming a ſort of Arch with an aſcending Ramus of the firſt Cervical Pair.

161. This Arch ſurrounds the Fore-part of the tranſverſe Apophyſis, and has ſeveral Communications with the firſt Ganglion of the great Sympathetic Nerve, and by its convex ſide, adheres very cloſely to thoſe of the eighth and ninth Pairs.

162. The ſuperiour Part of this Arch or Ganglion ſends up a conſiderable Nerve, which is increaſed by the Addition of a ſhort Ramus belonging to the firſt Cervical Pair, and running upward and backward on the convex ſide of the Os Occipitis, is diſtributed to the ſuperiour and lateral Parts of the Head, by ſeveral Ramifications. This Branch is termed Nervus Occipitalis.

163. These Sub-Occipital Nerves have this in common with the other Nerves of the Medulla Oblongata, that each ariſes only by one anteriour Faſciculus of Filaments, without any poſteriour Faſciculus, as in the vertebral Nerves. We ſometimes obſerve indeed, a ſmall poſteriour ſingle Filament on each ſide, but this ſeems rather to belong to the Nervus Acceſſorius of the eighth Pair, than to the Tenth.

164. The particular Deſcription of the Courſe, Diviſion, and great Extent of the Nervi Sympathetici Maximi, commonly called Intercoſtales, will come in moſt properly after that of all the vertebral Nerves, with which they almoſt univerſally communicate.

*The Vertebral Nerves in general.*

165. The vertebral Nerves are all thoſe which ariſe from the Medulla Spinalis, and go out from the great Canal of the Spine, through the lateral Foramina formed by the correſponding Notches in the Vertebræ.

166. The Original Trunk of each vertebral Nerve ariſes commonly by two flat Faſciculi of medullary or nervous Filaments, one anteriour, the other poſteriour. Theſe two Faſciculi on each ſide run towards each other, and perforate laterally the Production of the Dura Mater; after which, they preſently unite in a kind of Ganglion, from which the Trunk is produced.

167. I reckon the vertebral Nerves by Pairs, in the common manner, beginning by thoſe which paſs between the firſt and ſecond Vertebra. This Enumeration agrees with that of the Vertebræ themſelves; there being ſeven Pairs of vertebral Nerves belonging to the Neck, termed Cervicales; twelve to the Back, called Dorſales; five to the Loins, named Lumbares; and five or ſix to the Os Sacrum, called Sacri.

168. This Diſtribution is fixed chiefly by the Dorſal Nerves, called Coſtales; for there is exactly the ſame number of theſe Nerves as of Ribs, and

the firſt Pair of Coſtal Nerves paſſes between the firſt and ſecond Vertebræ of the Back.

169. This is not the proper place to take notice, that the ſpinal Marrow from which all theſe Nerves ariſe, does not go down ſo low as the bony Canal of the Spine, *&c.* Theſe Obſervations muſt be referred to the Deſcription of the Brain, of which this Medulla is the true Continuation.

170. The firſt Pair of Cervical Nerves paſſes between the firſt and ſecond Vertebra of the Neck; lying more backward than the ſubſequent Pairs, and having larger Ganglions.

*Firſt Pair of Cervical Nerves.*

171. The Trunk of each of theſe Nerves, ſends out anteriourly a ſmall Ramus, which runs up on the foreſide of the tranſverſe Apophyſis of the firſt Vertebra, and forms a communicating Arch with the ſmall deſcending Ramus of the Nervus Sub-Occipitalis of the ſame ſide, already mentioned; and conſequently communicates likewiſe with the great Sympathetic Nerve.

172. Posteriourly it ſends out a conſiderable Branch, which is ſoon increaſed by a communicating Branch from the ſecond Cervical Pair. This Branch communicates alſo with the Sub-Occipitalis, and afterwards paſſes between the Muſculus Complexus and Rectus Minor Poſticus of the Head; and bending backward, is diſtributed to the other ſmall poſteriour Muſcles of the Head, and to the Splenius, Complexus, and Trapezius. It paſſes next, over theſe Muſcles to the Occiput, where it is ramified, backward, upward, and forward, to the Muſculus Occipitalis, and Temporalis of the ſame ſide.

173. It likewiſe gives off a Filament, which dividing into two, ſends up one Portion to the Muſculus Sterno-Maſtoidæus, round the Nervus Acceſſorius Octavi Paris, or Sympatheticus Medius, and running afterwards behind that Muſcle, it is diſtributed to the Splenius.

174. The other Portion of this Filament runs downward, and bending in a particular manner, communicates with the ſecond Cervical Pair, and with the Sympatheticus Major. It likewiſe ſends ſmaller Filaments to the anteriour Muſcles of the Head and Neck, and to the Sterno-Maſtoidæus, and Splenius.

175. One of theſe ſmall Filaments communicates with the great Nervus Lingualis, or ninth Pair from the Brain, and goes to the Muſculus Sterno-Hyoidæus, Thyro-Hyoidæus, and Thyroide Glands.

*Second Pair of Cervical Nerves.*

176. The ſecond Cervical Pair paſſes between the ſecond and third Vertebra of the Neck; and as it goes out, communicates forward with the great Ganglion of the Sympatheticus Maximus, upwards, with the firſt Cervical Pair, and downward, with the third.

177. Afterwards the Trunk on each ſide is divided into ſeveral Branches; but from the place of its Union with the firſt Pair, it ſends off firſt of all, one Filament, and then another from where it joins the third Pair.

178. Lower down, theſe two Filaments unite into one, which runs down along the internal Jugular Vein, and then forming a conſiderable Arch, runs up along the Carotid Artery, as high as the Parotid Gland, where it joins and communicates with the Trunk of the ninth Pair of the Medulla Oblongata.

longata. A Filament is detached from the Curvature or Arch, which is ſpent on the Muſculus Coraco-Hyoidæus, Sterno-Hyoidæus, and Sterno-Thyroidæus.

179. OPPOSITE to the Sterno-Maſtoidæus, the Trunk ſends off a Branch, which behind that Muſcle, communicates with the Nervus Acceſſorius of the eighth Pair, after the manner of a Plexus.

180. THIS Branch runs afterward behind the Muſculus Splenius, perforates the upper Portion of the Trapezius, between the great Occipital Nerve and the Ear, and aſcends to the lateral Part of the Occiput, where it communicates with its fellow from the other ſide. It is diſtributed on each ſide, to the Muſcles juſt mentioned, and to the Angularis Scapulæ.

181. THE Trunk of this ſecond Cervical Pair ſends down other Branches to the middle part of the Muſculus Trapezius, Sterno-Maſtoidæus, and neighbouring vertebral Muſcles; and ſometimes we obſerve a Communication backward, between this Trunk and the third Cervical Pair.

182. HAVING given off theſe Branches, this Trunk advances toward the poſteriour Edge of the middle Portion of the Sterno-Maſtoidæus, upon which it bends from behind forward, ſending out ſeveral Branches. The firſt Branch runs downward and backward, and is diſtributed by ſeveral Rami to the Muſculus Scalenus, Tranſverſalis Colli, *&c.*

183. THE ſecond Branch communicates with the third Cervical Pair, at the place where this Pair produces the Diaphragmatic Nerve, to the Formation of which it contributes. The third Branch is only a Filament which running upward, communicates with one or two Filaments of the inferiour Branch of the Portio Dura Nervi Auditorii.

184. THE Extremity of this Curvature on the foreſide of the Sterno-Maſtoidæus, is divided into two Branches, one of which runs upward, the other downward. The ſuperiour Branch aſcends on this Muſcle, to the lower part of the Ear, ſending one Ramus behind the Ear, and another to the Parotid Gland, where it joins the Trunk of the Portio Dura of the Auditory Nerve, and runs up on the foreſide of the Ear.

185. THE inferiour Branch runs from behind forward, to be ramified on the Muſculus Cutaneus, and diſtributed to the Integuments of the Throat, in which it is loſt near the Larynx, having firſt given Rami to the Muſculi Sterno-Hyoidæi. It likewiſe communicates with a deſcending Branch of the Portio Dura, and with another of the ninth Pair from the Brain.

186. NEAR its Origin, this inferiour Branch ſends down a Ramus on the backſide of the Sterno-Maſtoidæus, gives other Rami to the Jugular Glands, to the Fat and Integuments of the lateral and lower part of the Neck, and paſſes before the middle Portion of the Clavicula, below which it is loſt in the lateral Integuments of the Thorax.

*Third Pair of Cervical Nerves.*

187. THE third Cervical Pair paſſes between the third and fourth Vertebræ of the Neck, and communicates upward with the ſecond Pair, downward with the fourth, and forward with the great Sympathetic Nerve, and with a Filament from the ninth Pair of the Medulla Oblongata. It com-

municates likewiſe with the Nervus Acceſſorius of the Sympatheticus Medius, by a Filament which goes to the Muſculus Trapezius.

188. Each Trunk of this third Pair, ſends ſeveral Branches to the anteriour, poſteriour, and lateral Parts of the Neck, that is, to the Muſcles, Glands, Membranes, Fat and Skin, all the way to the neighbouring upper Parts of the Thorax and Shoulder.

189. Among the poſteriour Branches, there is one which goes to the Muſculus Supra-Spinatus, and paſſing over the Notch in the ſuperiour Coſta of the Scapula, gives Filaments to the Extremity of the Omo-Hyoidæus; and there is another ſmall one, which in its paſſage to the Muſculus Trapezius, communicates with a Filament of the Nervus Acceſſorius of the eighth Pair.

190. Of the middle Branches, ſome go to the Jugular Glands, to the Muſculi Subclavii, to the neighbouring Portions of the Pectoralis, Deltoides, and Trapezius, and to the Integuments which lie thereabouts.

191. Among the anteriour Branches, there is one, which being ſtrengthned by a Ramus from the ſecond Cervical Pair, unites lower down with another Ramus of the fourth Pair, and thus forms the Nervus Diaphragmaticus.

192. This Diaphragmatic Nerve runs on the foreſide of the Muſculus Scalenus, and enters the Thorax behind the anteriour Extremity of the Clavicula, receiving immediately afterwards, a Filament from the firſt Dorſal Pair, and communicating with the great Sympatheticus. It runs down obliquely forward, before the Subclavian Artery, and on one ſide of the Nervus Sympatheticus Medius, near the Origin of the Recurrent.

193. In the Thorax, this Diaphragmatic Nerve runs down immediately before the Origin or Root of the Lung, along one ſide of the Pericardium, to which it adheres very cloſely, and then running a little backward, it ſoon enters the Diaphragm.

194. It is diſtributed by numerous Ramifications on the great Muſcle of that Organ, ſending likewiſe ſome Filaments to the lower Portion, by which it communicates with the great Sympathetic Nerve, and with the neighbouring Plexus of the Abdomen.

195. The right Diaphragmatic Nerve runs along the Vena Cava ſuperior, and on that account appears to be ſituated more anteriourly than the left.

196. This left Diaphragmatic Nerve lies firſt of all a little backward, toward the Trunk of the Aorta, and afterwards runs in a longer Courſe than the right, being bent, in order to paſs by that Portion of the Pericardium, which anſwers to the Apex of the Heart; for which reaſon it is longer than the right. From thence it is bent backward, and diſtributed to the Diaphragm in the ſame manner with the other.

*The laſt four Pairs of Cervical Nerves in general.*

197. The laſt four Cervical Pairs paſs between the Portions of the Muſculus Scalenus, being in general larger than the three former. They are united by their Trunks, and together with the communicating Branch of the third Pair, and Trunk of the firſt Dorſal Pair, they form a very large Plexus, which is in a manner incloſed in a membranous Vagina, and produces

ſix conſiderable Ropes, like ſo many particular Trunks, which are diſtributed to the upper Extremity, and go by the general name of Nervi Brachiales.

*The Brachial Nerves in general.*

198. The Brachial Nerves conſiſt of ſix Ropes on each ſide, as has been ſaid; and in the Year 1697, M. *Duvernay* gave to five of them, the following names: Nervus Muſculo-Cutaneus ſive Cutaneus Externus, Medianus, Cubitalis, Cutaneus Internus, and Radialis, taking for a Branch of the Radialis that Nerve which I look upon as the ſixth principal Rope, and which I name Axillaris, or Articularis.

199. These ſix Ropes do not ariſe ſeparately; and their Origin is ſo complicated, that it is not an eaſy matter to determine it: But in general, it ſeems that each of the five vertebral Pairs, which form the great Plexus, contributes to the Formation of each Brachial Rope.

200. Four of theſe Nerves ariſe anteriourly from the great Plexus, *viz.* the Muſculo-Cutaneus, Medianus, Cubitalis, and Cutaneus Internus; and the other two, the Radialis and Axillaris, ariſe poſteriourly.

201. The five vertebral Pairs form the large Plexus in the following manner.

202. The fourth and fifth Cervical Pairs, about an Inch or more after they go out, unite into one common Trunk. The ſeventh Cervical and firſt Dorſal Pair unite likewiſe into one Trunk, very near their Origin. The ſixth Cervical Pair runs ſingly for a conſiderable ſpace, between the two other Trunks, and afterwards is increaſed by a communicating Portion which it receives from each of them.

203. These five large vertebral Nerves on each ſide, thus mingled, interwoven and complicated together, divide again, and are diſpoſed in a quite different manner from what is ordinary, forming the ſix Brachial Ropes. There is, however, ſome Variety in this Plaxiform Union and Mixture.

204. The manner in which the ſix Brachial Nerves ariſe from the great Plexus, is commonly as follows.

205. The Nervus Muſculo-Cutaneus is formed by the Union of the fourth and fifth Cervical Pairs, and by their collateral Communication with the third and ſixth Pairs.

206. The Medianus comes on one ſide, from the Union of the ſixth Cervical Pair, with the fourth and fifth; and on the other, from the Union of the ſeventh Pair, with the firſt Dorſalis. Theſe two Unions form an acute Angle, the Apex of which produces the Median Nerve.

207. The Cubitalis goes out from the Union of the ſeventh Cervical, with the firſt Dorſal Pair, a little nearer the lower ſide of the Angle of the Medianus.

208. The Cutaneus Internus ariſes much in the ſame manner.

209. The Radialis is the largeſt of the ſix, and goes out from the Apex of another nervous Angle, the upper ſide of which is formed by the Union of the Trunks of the fourth, fifth and ſixth Pairs; and the lower ſide by the Union of the ſeventh Cervicalis and firſt Dorſalis.

210. The Axillaris goes out cloſe to the Radialis, chiefly from the upper ſide of the Nervous Angle, and communicates with all the reſt.

211. Besides the great Brachial Nerves, ſeveral ſmall Branches go out from each of the laſt four Pairs; and it will be proper to deſcribe all theſe Branches, together with the Trunks they belong to, before we go on to the Diſtribution of the Brachial Nerves.

*Fourth Pair of Cervical Nerves.*

212. The fourth Cervical Pair paſſes between the fourth and fifth Vertebræ of the Neck, and communicates above with the third Pair, below, with the fifth, and forward with the great Sympathetic.

213. It ſends ſeveral Rami to the Muſculus Scalenus, Angularis Scapulæ Rhomboides, Trapezius, and Pectoralis Major; and likewiſe gives off a Filament, which contributes to the Formation of the Nervus Diaphragmaticus. Afterwards it advances a Finger's breadth without any Ramification, and joins the Trunk of the fifth Cervical Pair.

214. At the place of this Union or a little before, it gives out a pretty conſiderable Branch, which having ſent a Filament to the Muſculus Subſcapularis, paſſes through the ſmall Notch in the ſuperior Coſta of the Scapula, and gives other Filaments to the Supra-Spinatus. This Ramus runs afterwards under the laſt named Muſcle, and under the Acromium, to the Infraſpinatus, and Teres Minor.

*Fifth Pair of Cervical Nerves.*

215. The fifth Cervical Pair paſſes between the fifth and ſixth Vertebræ of the Neck, communicating with the fourth and ſixth Pairs, and with the great Sympatheticus.

216. Afterwards each Trunk ſends forward a Ramus, which uniting with a like Ramus from the ſixth Pair, is diſtributed to the Muſculus Scalenus, to the Surface of the Pectoralis Major, and to the neighbouring Teguments. This Trunk ſends off likewiſe near its Origin another Ramus, which runs down behind the Origin of the ſixth Pair, from which it receives a ſmall communicating Filament.

217. Being thus ſtrengthened, it runs down on the outſide of the Thorax, and is diſtributed to the Muſcles ſituated there; paſſing firſt under the two Pectorales, and then between the Serratus Major and Subſcapularis.

218. Afterwards continuing its Courſe downward, it reaches the anteriour, middle and almoſt the lower part of the Latiſſimus Dorſi at the third falſe Rib, and terminates in this Muſcle, and in the Integuments.

*The laſt two Pairs of Cervical Nerves.*

219. The ſixth and ſeventh Cervical Pairs having paſſed in the common manner, under the ſixth and ſeventh Vertebræ of the Neck, and having communicated with the other Nerves near them, ſend ſeveral Filaments to the neighbouring Parts.

220. The Branch of the ſixth Pair, which unites anteriourly with a like Branch of the fifth Pair, to be diſtributed on the Thorax, as has been ſaid, ſends down a Filament, which together with another common to the ſeventh Cervical, and firſt Dorſal Pair, forms a kind of Arch, under which the Axillary Artery paſſes.

221. All theſe Nerves give Filaments to the neighbouring Integuments; and ſome go likewiſe to the Axillary Glands.

*Nervus Muſculo-Cutaneus.*

222. The Muſculo-Cutaneous Nerve, which naturally lies on one ſide of the Cutaneus Internus, ariſes from the Union of the fourth and fifth

Cervical Pairs, and partakes of their lateral Communication with the third and ſixth Pairs.

223. Having reached the upper Extremity of the Muſculus Coraco-Brachialis, it perforates it obliquely from above downward, and gives it ſeveral Filaments. Afterwards it runs down on the Arm behind, and under the Biceps, to both Portions of which it gives Rami.

224. Having got from behind the Biceps, it runs from within outward, between the lower Extremity of that Muſcle and of the Brachialis, which it likewiſe ſupplies. In the Fold of the Arm, it reaches the Skin immediately behind the Vena Mediana, and there it becomes a true Nervus Cutaneus. From thence it runs along, between the Supinator Longus and the Integuments, on the inſide of the Cephalic Vein, all the way to the Thumb.

225. It is diſtributed to the Integuments on the foreſide of the Carpus to thoſe of the Thumb and of the convex part of the Hand. Before it reaches the Wriſt, it paſſes over the Cephalic Vein, and communicates at the Thumb with a Branch of the Radial Nerve.

*Nervus Medianus.* 226. The Nervus Medianus lies between the Muſculo-Cutaneus and Cubitalis. It ariſes from the Union of three Branches, one belonging to the ſixth cervical Pair, one to the ſeventh, and one to the firſt Dorſalis. In ſome Subjects it is formed by the Union of two principal Branches, one of which comes from the Union of the firſt Dorſalis with the laſt Cervicalis, the other from the Union of the fourth, fifth and ſixth Cervicales.

227. It runs down on the Arm, along with the Brachial Artery, under the inner Edge of the Biceps, having firſt paſs'd behind the inferiour Inſertion of the Coraco-Brachialis, and reaches the Fold of the Arm between the lower Extremity of the Muſculus Brachialis and Pronator Teres; giving Filaments in its paſſage to all theſe Muſcles on both ſides.

228. It paſſes behind the Ramus Medianus of the Baſilic Vein, as it approaches the inner Condyle; and then runs backward croſs the Pronator Teres, and downward between the Perforatus and Perforans to which it gives Rami.

229. Below the Pronator Teres, it ſends off a particular Ramus, which runs along the Interoſſeous Ligament, behind the Pronator Quadratus, all the way to the Wriſt, giving Filaments to that Muſcle.

230. Afterwards, having detached ſome Cutaneous Ramifications, the Trunk paſſes under the internal tranſverſe Ligament of the Carpus, to the Palm of the Hand, where it ſends off numerous Rami to the Muſculus Thenar and Anti-thenar, two to the lateral concave parts of the Thumb, two to thoſe of the Index, two to thoſe of the middle Finger, and one to the neareſt ſide of the Ring Finger, after having communicated with a Ramus of the Cubital Nerve. Theſe Rami go all the way to the ends of the Fingers, ſupplying the Integuments, Ligaments, and Tendons.

*Nervus Cubitalis.* 231. The Cubital Nerve ariſes from the Union of the ſeventh Cervical, with the firſt Dorſal Pair; and communicates with the lower Root of the Median Vein.

232. It runs down on the inſide of the Arm, along the Muſculus Anconæus Maximus, between the Brachial Artery and the Baſilic Vein; ſending off only ſmall Filaments to the neighbouring Muſcles and Integuments.

233. It runs in between the inner Condyle of the Os Humeri and the Olecranum, where it is covered only by a kind of Ligament, and by the common Integuments; and this is what makes ſtrokes upon the Elbow ſo painful, even all the way to the little Finger where this Nerve ends.

234. Afterwards it runs down on the Muſculus Ulnaris Internus, giving Filaments to the neighbouring Muſcles, to the Pronator Quadratus and Integuments; and at the lower Extremity of the Ulna, it is divided into two Branches, one large, the other ſmall.

235. The large Branch, which may be reckoned the Continuation of the Trunk, paſſes on one ſide of the Os Piſiforme, under the great tranſverſe Ligament of the Carpus, to that part of the Palm of the Hand which anſwers to the laſt two Fingers, where it gives ſome Filaments to the Integuments and Ligaments of the Carpus.

236. Afterwards it divides into three particular Branches, one of which forms a kind of Arch, being diſtributed to the neighbouring ſmall Muſcles of the Thumb and to the Interoſſei; the ſecond is bifurcated, and goes to the correſponding lateral concave parts of the Ring and little Fingers; and the third goes to the oppoſite lateral part of the little Finger, and to the neighbouring Muſcles.

237. The ſmall Branch is turned outward, behind the Tendon of the Ulnaris Externus, and goes to that part of the Back of the Hand which anſwers to the laſt two Fingers. It is diſtributed to the lateral convex parts of theſe two Fingers, much in the ſame manner as the other Branch, to the lateral concave Parts. It likewiſe ſupplies the Muſculus Hypothenar, Metacarpius, and the Integuments, and communicates with a Ramus of the Nervus Medianus.

*Nervus Cutaneus Internus.*

238. The internal Cutaneous Nerve is very ſmall, and ariſes from the Union of the ſeventh Cervical and firſt Dorſal Pairs, but chiefly from the latter. It runs over the other Brachial Nerves, and paſſes down on the inſide of the Arm, between the Muſcles and Integuments.

239. It divides firſt of all into two Branches, which accompany each other very cloſely, as far as the inner Condyle, on one ſide of the Vena Baſilica, being covered by the Ramus Medianus of that Vein.

240. One of theſe Branches runs down under the Integuments, which cover the Muſculus Radialis Internus and Ulnaris Gracilis, and is afterwards ramified on the Skin which covers the Wriſt and beginning of the Palm of the Hand.

241. The other Branch runs a little more backward along the Integuments which cover the Muſculus Ulnaris Internus and Ulna, upon which it is ramified all the way to the little Finger.

*Nervus Radialis.*

242. The Radial Nerve, ſo called, becauſe it accompanies the Radius and the Radial Artery, ariſes from the Union of three compound Branches,

one of which comes from the united Trunks of the fourth and fifth Cervical Pairs; the ſecond from the ſingle Trunk of the ſixth Pair, and the third from the united Trunks of the ſeventh Cervical and firſt Dorſal Pairs.

243. The Trunk of this Nerve lies deeper than the reſt; and it runs firſt of all, from before backward, bending round the Os Humeri, between the Muſculi Anconæi and that Bone.

244. This Curvature is oblique and contorted, anſwering to the Impreſſion obſervable on the Bone; and above it, the Radial Nerve gives Branches to the three Anconæi, eſpecially to the Longus and Externus. Afterwards it turns from behind forward, between the Anconæus Externus and Brachialis.

245. It ſends off from the Curvature or Arch, ſome Cutaneous Rami, the moſt conſiderable of which goes to the external Condyle of the Os Humeri, and is diſtributed to all the Integuments which cover the Radius on the fore and outer Sides, and to thoſe which cover the exteriour parts of the Carpus and Back of the Hand, all the way to the Thumb.

246. At the Fold of the Arm, the Radial Nerve turns outward, and runs down between the lower Extremity of the Muſculus Brachialis and upper Extremity of the Supinator Longus, giving Rami to theſe and to the neighbouring Muſcles.

247. Having reached the Extremity of the Radius, it divides into two, or rather ſends off a large Branch, which paſſes between the Radius and Supinator Longus, below the middle of the Bone, where it runs in between the Supinator Longus and Radialis.

248. This Branch accompanies the external Radial Artery near the Integuments, and having got to the lower part of the Radius, it is diſtributed in three Rami, to the convex lateral parts of three Fingers and an half.

249. One Ramus goes to the internal lateral part of the Thumb, and to the Integuments. The ſecond is divided into two for the external lateral part of the Thumb and anteriour lateral part of the Index, giving Filaments in its paſſage to the Integuments of the metacarpal Bones. The third Ramus is divided into ſeveral leſſer Ramifications which go to the poſteriour lateral parts of the Index, to both ſides of the middle Finger, and to the anteriour lateral part of the Ring Finger.

250. Through all this Courſe, this Branch ſupplies the Integuments and Interoſſeous Muſcles.

251. The Trunk or largeſt Branch of the Radial Nerve, paſſes between the upper Extremity of the Radius and Muſculus Supinator Brevis; and in its paſſage, ſupplies this Muſcle, the Anconæus Minimus, Supinator Longus, and Radialis Externus.

252. Afterwards it is loſt in the Extenſor Digitorum Communis, and in the Muſcles of the Carpus and Thumb, having firſt communicated with a Ramus of the Muſculo-Cutaneous Nerve.

*Nervus Axillaris.*

253. The Axillary or Articular Nerve ariſes from the laſt two Cervical Pairs, and ſometimes ſeems to be no more than a large Branch of the Nervus Radialis. It runs in the Hollow of the Axilla, behind the Head

of the Os Humeri, between the Muſculus Teres Major and Minor ; and bends or turns from within outward and backward, round the Neck of that Bone, running between the Articulation and the upper Extremity of the Anconæus Longus, to the Deltoides.

254. It is divided into ſeveral Rami, which go chiefly to the upper and lower parts of the Deltoides, upon which they are ramified, ſupplying in their paſſage, the Sub-ſcapularis, the upper Extremity of the Anconæus Longus, Teres Major and Minor and Supra-ſpinatus. It likewiſe gives ſome Nerves to the Latiſſimus Dorſi, and Anconæus Externus.

*Nervi Dorſales ſive Coſtales.*

255. The Dorſal or Coſtal Nerves conſiſt of twelve Pairs, as has been already ſaid, and they deſerve more juſtly to be called Intercoſtales, than the great Sympathetic Nerve to which that name has been commonly given.

256. They have this in common with each other, that as ſoon as they leave the Vertebræ of the Back, before they begin to accompany the Ribs, they ſend out two Filaments anteriourly which communicate with the great Sympathetic Nerve and ſeveral Filaments backward, to the Vertebral and other Muſcles.

257. Each of theſe twelve Pairs is numbered from the Vertebra, under which it goes out ; thus the firſt Pair is that which paſſes under the firſt Vertebra of the Back, and ſo of the reſt.

258. The firſt Pair enters the Compoſition of the Nervi Brachiales, as has been ſaid, and together with the ſecond Pair, it ſends off the Rami Thoracici.

259. The ſeven ſuperiour Pairs run along the under ſides of the true Ribs, all the way to the Sternum ; being diſtributed to the Intercoſtal Muſcles, which they perforate likewiſe from within outward, to go to the Serratus Major, Pectoralis and external Integuments.

260 The ſeventh Pair having reached the Cartilaginous Portion of the ſeventh true Rib, runs down to the broad Muſcles of the Abdomen, to which it is diſtributed.

261. The loweſt five Pairs leave the Extremities of the falſe Ribs, and go to the Muſcles of the Abdomen.

262. The eleventh Pair gives likewiſe ſome Filaments to the Diaphragm, and then runs in between the Muſculi Tranſverſales and Peritonæum.

263. The twelfth is diſtributed to the Tranſverſales and Obliqui Interni.

264. All theſe Nerves ſend numerous Ramifications through the Muſcles, to the Integuments ; which form the Cutaneous Nerves of the Thorax, of the upper two Regions of the Abdomen, and of the Superior Portion of the Loins.

*Nervi Lumbares.*

265. All the five Pairs of Lumbar Nerves ſend Filaments backward to the vertebral Muſcles, communicate with each other, and with the great Sympatheticus on each ſide, and are covered by the Pſoas Muſcle.

266. The Branches which communicate with the great Sympathetic Nerve are long, becauſe they advance forward a conſiderable way on the Bodies of the Vertebræ Lumbares.

267. The Lumbar Nerves are denominated from the Vertebræ, under which they paſs.

*Firſt Pair of Lumbar Nerves.* 268. The firſt Pair paſſes between the firſt and ſecond Vertebræ of the Loins, and each receives a communicating Branch from the laſt Dorſal Pair, and gives out another to the ſecond Lumbar Pair, or to a Branch thereof.

269. Each Trunk communicates with the great Sympatheticus, by a pretty long Ramus; and afterwards gives out three Branches, one poſteriour, and two anteriour, whereof one is external and large, the other internal and ſmall.

270. The poſteriour Branch perforates the Muſculus Quadratus Lumborum, runs in between the back parts of the oblique Muſcles of the Abdomen, pierces the Obliquus Externus, and is diſtributed to the Skin all the way to the Clunes. This Branch ſupplies alſo the vertebral Muſcles, and Sacro-Lumbaris.

271. The external anteriour Branch perforates the upper Extremity of the Muſculus Pſoas, obliquely outward, paſſes over the Quadratus Lumborum, and runs along the Criſta of the Os Ilium, to the anteriour Spine of that Bone.

272. It gives Filaments to the Abdominal Muſcles, and ſupplies the Faſcia Lata, neighbouring Integuments, and thoſe of the anteriour part of the outſide of the Thigh, and the Inguinal Glands.

273. The internal anteriour Branch perforates the Pſoas almoſt at the ſame place with the former, but a little more forward; and then paſſes over the Muſculus Iliacus, to the beginning of the Ligamentum Falloppii, where it unites with the other anteriour Branch, and by this Union forms a Nerve, which runs along that Ligament, and along the inſide of the Aponeuroſis of the Obliquus Externus, all the way to the Opening, commonly called the Ring of that Muſcle.

274. This Nerve goes out by that Opening, and afterwards divides into ſeveral Cutaneous Filaments, which go to the Pubis and Integuments of the Parts of Generation in both Sexes, *&c.* It likewiſe ſupplies the ſpermatic Ropes, and thoſe vaſcular Ropes falſely called the round Ligaments.

275. Besides theſe Branches, the Trunk of this firſt Pair, near its Union with the ſecond, ſends out two ſmall Rami, cloſely united together, which run down behind the Pſoas Muſcle, over one tendinous Inſertion of the ſmall Muſcle of the Diaphragm, in the third Vertebra of the Loins, and communicate with the great Sympathetic Nerve.

276. These two Rami accompany each other in this manner, all the way to the Ligamentum Falloppii; from whence one goes to the Teſticles, in company with the ſpermatic Veſſels; the other paſſes under the Ligament to the Skin and Glands of the Inguen.

277. At the place of this Diviſion, the Trunk ſends a Branch directly downward, which joins the ſecond Lumbar Pair, or rather a Branch thereof; and afterwards contributes to the Formation of the large Rope, termed Nervus Cruralis.

*Second Pair of Lumbar Nerves.*

278. The Trunks of the ſecond Pair of the Lumbar Nerves, go out between the ſecond and third Vertebræ of the Loins; and having communicated with the firſt Pair, and with the great Sympathetic Nerve, each Trunk gives off ſeveral ſmall Filaments to the neighbouring parts of the Muſculus Pſoas, and a large Ramus backward, to the Quadratus-Lumborum, Sacro-Lumbaris, Longiſſimus Dorſi, and neighbouring vertebral Muſcles, the Quadratus having firſt been perforated by it.

279. Afterwards the Trunk ſends out a ſmall Branch, which near its Origin joins a deſcending Ramus of the firſt Pair already mentioned. Being thus ſtrengthened, it perforates the Head of the Pſoas, runs along that whole Muſcle, to the Fiſſure of the Obliquus Externus, and is diſtributed to the Inguinal Glands, to the Fat and Scrotum in Males, and in Females to the Labia.

280. The ſame Trunk ſends out two other Branches, which accompany each other, and likewiſe a ſmall Ramus between the Origins of theſe two, which goes to the upper part of the Pſoas. Theſe two Branches perforate the Pſoas in different Places; and afterwards, continuing ſtill near each other, they paſs under the upper part of the Ligamentum Falloppii, and ſo go out of the Abdomen.

281. As they go out, they unite and form one Nerve, which is diſtributed by ſeveral Rami to the Inguinal Glands, the Aponeuroſis Cruralis, and Integuments of the Fore-part of the Thigh, all the way to the Knee.

282. Some of theſe Rami unite with thoſe of the Nervus Cruralis; ſome are diſtributed to the Integuments on the inſide of the Thigh; and one accompanies the Crural Artery, over one Branch of which, it runs in form of an Arch.

283. This Trunk ſends out oftentimes another Ramus, which unites with one from the third, and one from the fourth Pairs, into a particular Rope, which paſſing to the Obturator Muſcles, is named Nervus Obturator.

284. Afterwards this Trunk runs downward, and having given a Ramus to the middle Portion of the Pſoas Muſcle, joins the Trunk of the third Pair, and contributes to the Formation of the Crural Nerve.

*Third Pair of Lumbar Nerves.*

285. The Trunks of the third Pair of Lumbar Nerves go out between the third and fourth Vertebræ of the Loins. Each Trunk communicates above with the ſecond Pair, before, with the great Sympathetic Nerve, and below, joins the Trunk of the fourth Pair. It ſends a conſiderable Ramus backward, between the tranſverſe Apophyſes which goes to the vertebral and other neighbouring Muſcles.

286. Before it unites with the fourth Pair, it ſends a conſiderable Branch downward, and having received a communicating Branch from the ſecond Pair, unites with one from the fourth Pair, and forms the Obturator Nerve.

287. It detaches likewiſe another large Branch which runs down between the Muſculus Iliacus, and Pſoas, and joins the Crural Rope on the outſide of the lower part of the Muſcle, laſt named. It may be reckoned a ſort of Nervus Acceſſorius to the Cruralis.

288. As the Trunk runs along the Pſoas, it gives off Filaments both to that, and to the Iliac Muſcle; and ſends down a Ramus, which paſſes under the Ligamentum Falloppii, to the Muſculus Pectineus; and laſtly, having joined a Branch of the ſecond Pair, it unites with the fourth Pair, to form the Nervus Cruralis.

*Fourth Pair of Lumbar Nerves.*

289. The Trunks of the fourth Pair of Lumbar Nerves go out between the fourth and fifth Vertebræ of the Loins; and each communicates above, with the third Pair, and before, with the great Sympathetic Nerve, oftentimes by two Filaments.

290. Each Trunk ſends Rami backward, to the vertebral and neighbouring Muſcles; and afterwards compleats the Formation of the Nervus Cruralis, together with the other Portions of the Lumbar Nerves, already mentioned.

291. From the ſame place, it ſends off a conſiderable Branch, which joining a Branch from the third Pair, and one from the ſecond, forms the Nervus Obturator.

292. Lastly, the remaining Part of the Trunk joins the fifth Pair of Lumbar Nerves.

*Nervus Obturator.*

293. The Obturator Nerve, formed in the manner already deſcribed, runs along the inner lateral Part of the Pſoas Muſcle, to the Pelvis, and goes out of the Abdomen, at the upper Part of the Obturator Muſcles, and Foramen Ovale of the Os Innominatum.

294. As it goes out, it ſupplies the Muſculi Obturatores and Pectineus; and is afterwards diſtributed by three principal Branches to all the Portions of the Triceps; and ſends other Rami between theſe Portions, to the Gracilis Internus.

*Fifth Pair of Lumbar Nerves.*

295. The fifth Pair of Lumbar Nerves paſſes between the laſt Vertebra of the Loins and Os Sacrum; each Trunk communicating above, with the fourth Pair, and before, with the great Sympathetic Nerve. It ſends Rami backward to the vertebral and neighbouring Muſcles, and even to the Glutæi; and as it bends forward, it ſends a ſmall Ramus to the Crural Nerve.

296. Afterwards the Trunk runs down on the Symphyſis of the Os Sacrum with the Os Ilium, enters the Pelvis, and having received a communicating Branch from the fourth Lumbar Pair, joins the Nervi Sacri, with which it forms a Plexus, that produces the Nervus Sciaticus, the largeſt Nerve of the Human Body, which is diſtributed to the lower Extremity.

*Nervi Sacri.*

297. The Nervi Sacri are thoſe that come from the Os Sacrum, the chief of which paſs through the anteriour Holes of that Bone, the reſt through the lateral Notches at the Extremity of that Bone, and in the Os Coccygis.

298. These Nerves are reckoned likewiſe by Pairs, of which there are commonly ſix; four paſſing through the great anteriour Holes, and two below them. This Number is increaſed, when there are five Pairs of great Holes; and ſome Filaments paſs likewiſe through the poſteriour Holes.

299. The firſt Pair is very large; all the reſt diminiſh gradually, and the laſt is very ſmall.

300. Those which paſs through the great Holes, unite together as ſoon as they enter the Pelvis, and together with the fifth Lumbar Pair, form the great Plexus for the Sciatic Nerve, already mentioned. They likewiſe ſend Rami backward through the Membranes of the poſteriour Holes, to the neighbouring Integuments.

301. The Trunks thus united and interwoven with each other, give off other ſmall Branches, beſides the great Sciatic Trunk; and it will be proper to deſcribe the moſt conſiderable of theſe Branches, together with the inferior Nervi Sacri, before we enter upon the Detail of the Ramifications of the great Sciaticus.

302. This Diſpoſition reſembles very much that of the laſt four Cervical Pairs and firſt Dorſalis, which are not only interwoven together, to form the Brachial Nerves; but likewiſe ſend off many Branches from their Origin.

303. From this Intertexture of the Nervi Sacri, eſpecially from the ſecond Pair, a Branch goes out to the Veſiculæ Seminales, Proſtater Gland, Uterus, Tubæ Falloppianæ, *&c.* Another Branch goes chiefly from the fourth Pair, partly to the places juſt named, and partly to the Bladder and Inteſtinum Rectum.

304. The ſame Intertexture, and chiefly the third Pair united in ſome Subjects with the ſecond, and in others with the fourth, and ſometimes with both, produces a Branch which goes out of the Pelvis over the Ligamentum Falloppii, paſſes on the inſide of the Tuberoſity, and inner Part of the Os Iſchium, and is diſtributed to the Corpus Cavernoſum, to the Muſcles thereof in both Sexes, to the neighbouring Parts of Generation, and to the Sphincters of the Anus.

305. The laſt two Pairs of Nervi Sacri are very ſmall. That which goes out immediately below the great Foramina, runs from behind forward, on each ſide, between the Extremity of the Os Sacrum, and Ligament of the Os Coccygis; being diſtributed chiefly to the Muſcles of the Anus, and neighbouring Integuments.

306. The next or laſt Pair of Nervi Sacri runs down almoſt directly from the Extremity of the Canal of the Os Sacrum, and is likewiſe diſtributed to the Anus, Integuments, *&c.*

307. From the Extremity of the Plexus of all the Nervi Sacri, immediately before the Formation of the great Sciatic Rope, a Branch goes out to the Glutæus Medius and Minimus. Another goes out poſteriourly, which is diſtributed partly to the Muſcles of the Corpus Cavernoſum, *&c.* and partly to the Glutæus Maximus, and neighbouring Integuments, by ſeveral Filaments, which reach as far as the Ham.

308. The Crural Nerve, formed by the complicated Union of the Trunks of the firſt, ſecond, and third Pairs of Lumbar Nerves, and of a Portion of the fourth, ſometimes increaſed by a Branch of the fifth Pair, as has been already obſerved, paſſes under the Ligamentum Falloppii, and goes out of the *Nervus Cruralis.*

Abdomen, on the outſide of the Crural Artery, which lies between this Nerve, and the Crural Vein.

309. As it goes out, it is divided into ſeveral Branches, ſome of which are detached from its Union with the Ramus Acceſſorius of the third Pair, but the greateſt Number goes out from the Trunk itſelf.

310. The Branches which go from its Union with the Nervus Acceſſorius, run down on the foreſide of the Thigh; and having reached the middle of the Muſculus Sartorius, they follow its Courſe, and are ſpent on the Integuments of the fore and inner Parts of the Knee.

311. The moſt anteriour Branch paſſes on the Faſcia Lata, or Aponeuroſis Cruralis, forming Cutaneous Nerves all the way to the Knee.

312. The internal Branch runs along the Tendon of the Sartorius, in the ſame manner, all the way to its Inſertion in the Tibia, where they are ſpent on the Integuments; and ſome of them go to the inner Ankle, and convex part of the Foot.

313. Afterwards the Crural Rope divides into a great number of Rami, which in their Courſe downward, are diſtributed to the anteriour Muſcles, *viz.* to the Rectus, Vaſti, and Cruralis; giving Rami in their paſſage, to the Triceps, Sartorius, Gracilis Internus, and Semi-Tendinoſus.

314. It likewiſe gives off a Branch, which runs down interiourly between the Sartorius and Triceps, in the ſame Courſe with the Crural Veſſels, as far as the middle of the Thigh.

315. Afterwards it runs near the Integuments, behind the Sartorius, to which it gives ſeveral Filaments; and continues this Courſe all the way to the Inſertion of that Muſcle.

316. Having reached the Tibia, it lies near the Vena Saphena, and follows the ſame Courſe with it, as far as the inner Ankle, where it detaches a great number of Cutaneous Filaments.

317. Lastly, it ends by Ramifications, on the inner and upper Part of the Foot; where one of the moſt anteriour Ramifications adheres very cloſely to the Saphena.

*Nervus Sciaticus.* 318. The great Sciatic Nerve being formed, as has been already ſaid; or as it ſometimes happens, from the laſt two Pairs of the Lumbares, and firſt three Pairs of the Sacri, runs obliquely backward, under the great Sinus of the Os Ilium, and under the Muſculus Pyriformis.

319. It goes this way, out of the Pelvis, paſſing between the Pyriformis, and ſuperior Gemellus; and then running on the foreſide of the firſt of theſe Muſcles, and preſently afterwards behind the two Gemelli and Quadratus Femoris, it gives Filaments to each of them.

320. It runs down in the next place, between the Tuberculum Iſchii, and the great Trochanter, along the inner and poſteriour Part of the Thigh, between the Muſculus Biceps and Semi-Nervoſus, as far as the hollow of the Poples, a little nearer to the internal Condyle than to the external, giving Rami in its paſſage to all theſe Muſcles, and to the Triceps, and diminiſhing gradually in Size as it deſcends.

321. As it goes out of the Pelvis, it gives out a Branch, which paſſes between the Portions of the Ligamentum Sciaticum, to the Anus, Perinæum, Parts of Generation, &c. and this Braneh joins a Ramus from the third Pair of the Nervi Sacri, which goes to the ſame Parts, as has been obſerved.

322. As it paſſes between the Tuberoſity of the Iſchium and the great Trochanter, it produces two Rami, one of which is ſpent on the Glutæus Maximus, the other divides into two, for the other two Glutæi.

323. Below the great Trochanter, where it may be termed Nervus Sciatico-Cruralis, it ſends back a Ramus, which runs down with the Sciatic Vein, and is diſtributed to the Integuments as low as the middle of the Calf of the Leg; and ſometimes lower toward the outer Ankle.

324. The Sciatic Nerve having reached the Ham, is commonly called Nervus Popliteus, and begins to be divided into two Branches, which run at firſt very cloſe to each other between the Extremities of the Biceps and Semi-Nervoſus; and afterwards ſeparate gradually, paſſing behind the Condyles of the Os Femoris, between the ſuperiour Extremities of the Gaſtrocnemii.

325. The innermoſt of theſe two Branches is very large, the outermoſt not ſo large. They are diſtributed to the whole Leg, and through this Courſe, they may be termed Nervi Sciatico-Tibiales.

326. The large Branch of the Sciatico-Cruralis or Cruralis Internus, which may likewiſe be termed Popliteus Internus, runs down behind the Muſculus Popliteus, on one ſide of the Tibialis Gracilis, commonly called Plantaris, and between the two Gaſtrocnemii.

327. Afterwards it pierces the upper Extremity of the Soleus, and runs down between this Muſcle and the great Flexors of the Toes, to the lower Extremity of the Tibia, near the inner Ankle.

328. In its paſſage, it ſends ſmall Rami to the Joint of the Knee, to the Gaſtrocnemius Internus, to the other Muſcles laſt mentioned, and to the Integuments, all the way down.

329. Besides theſe ſmall Rami, it ſends off another more conſiderable Branch towards its upper part, from which, one Filament goes to the Tipialis Poſticus, another perforates the Interoſſeous Ligament, and is diſtributed to the upper part of the Tibialis Anticus.

330. Soon after this, it detaches externally a long Ramus, which runs down on the backſide of the Leg, between the Integuments and external Gaſtrocnemius, on one ſide of the Vena Sciatica or Saphena Externa.

331. This long Ramus joins a Branch of the Sciaticus Externus Minor, ſends off Filaments toward each ſide, through its whole Courſe, and having ſupplied the Tendo Achillis, paſſes behind and under the outer Ankle.

332. This Ramus paſſes afterwards on the outſide of the Foot, where it is diſtributed to the Integuments, and neighbouring Muſcles, and terminates on both ſides of the little Toe, and on the outſide of the Toe next to that.

333. The large Sciatic Branch or Sciatico-Tibialis, having given off theſe different Ramifications, paſſes behind the inner Ankle, through a particular annular Ligament, and runs downward to the great lateral Sinus of the Os

Calcis,

Calcis, paſſing firſt between that Bone and the Muſculus Thenar, and then between it and the poſteriour Inſertion of the Flexor Digitorum Brevis.

334. At this place, having firſt ſent ſmall Filaments to the neighbouring parts, it divides into two Rami, named Nervi Plantares, one internal and large, the other external.

335. The Nervus Plantaris Internus is diſtributed to the Foot, much in the ſame manner as the Radial Nerve to the Hand. It runs firſt along the inſide of the Sole of the Foot, and ſends Filaments to the Thenar, Flexor Digitorum Brevis, and to the Muſculus Lumbricalium Acceſſorius.

336. Afterwards it ſends four Branches to the lateral concave or lower parts of the firſt three Toes, and to the neareſt lateral part of the fourth Toe. The firſt Ramus goes to the inſide of the great Toe. The ſecond divides into two, for the correſponding ſides of the great Toe and the ſecond. The third being bifurcated in the ſame manner, goes to the ſecond and third Toes; and the fourth to the third and fourth Toes.

337. These Nerves communicate on each ſide at the Extremities of the Toes, and in their paſſage, give Filaments to the Muſculi Lumbricales, Interoſſei, and neighbouring Ligaments and Integuments.

338. The external Plantaris paſſes between the Muſculus Lumbricalium Acceſſorius, and the Flexor Digitorum Brevis, giving Filaments to theſe Muſcles, to the Interoſſei, and to the Hypothenar Minimi Digiti; and afterwards it divides into two Branches.

339. The firſt Branch runs in the Interſtice between the laſt two Toes, and being divided, goes to the correſponding lateral parts of both. The other Branch goes to the inferiour external lateral part of the little Toe.

340. During this Courſe, the external Nervus Plantaris ſupplies the Aponeuroſis Plantaris, and the Ligaments and Integuments in the ſame manner as the reſt.

341. The ſmall Sciatic Ramus or Sciaticus Externus, called likewiſe Sciatico-Peronæus, runs outward over the Head of the Fibula; and is divided into ſeveral Rami, among which there are three or four conſiderable, one poſteriour, one ſuperiour and anteriour, one internal and anteriour, and one external and anteriour.

342. The poſteriour Ramus runs down between the Integuments and the Fibula, as low as the outer Ankle, and terminates in the outſide of the Foot; having detached ſeveral Cutaneous Filaments in its paſſage.

343. About the middle of the Fibula, it ſends out a ſmall Ramus, which joins another Ramus from the large or tibial Ramus of the Sciatic Nerve, and is diſtributed together with it in the manner already ſaid.

344. The poſteriour Ramus of the ſmall Sciatic Branch, having reached the outer Ankle, runs up a little way on the Foot, towards the Root of the fourth Toe, where it divides into two ſmaller Rami.

345. One of theſe Rami divides into two others, for the correſponding lateral parts of the third and fourth Toes; the other goes to the external lateral part of the fourth Toe, where it joins a Ramus of the external Nervus Plantaris, which is diſtributed to the laſt two Toes.

346. After having ſent off the poſteriour Ramus, the ſmall Sciatic Branch runs outward over the Head of the Fibula; and having given ſome Filaments to the Gaſtrocnemii and Soleus, it runs a-croſs the upper Extremity of the Peronæus Poſticus from behind forward.

347. Afterward it paſſes between the Bone and the Muſcle laſt named, and ſends ſeveral Filaments forward to the neighbouring parts, and then produces the three or four Rami already mentioned, which are diſtributed in the following manner.

348. The ſuperiour and anteriour Ramus runs a little tranſverſely between the Head of the Fibula and the upper Extremity of the Extenſor Digitorum Longus; and having given Filaments to this Muſcle, and to the Extenſor Pollicis Longus, it is diſtributed to the upper Extremity of the Tibialis Anticus, giving Filaments to the neighbouring Integuments.

349. The inner anteriour Ramus runs down on the foreſide of the interoſſeous Ligament, between the Extenſor Pollicis Longus and Tibialis Anticus, giving Filaments to each of theſe Muſcles.

350. It paſſes afterwards under the annular Ligament of the Extenſor Muſcles, behind the Extenſor Pollicis, to the upper part of the Foot, under the Extenſor Digitorum Brevis. In its paſſage, it gives Filaments to that Muſcle, and to the firſt ſuperiour Interoſſei.

351. Having communicated by a Filament with the external anteriour Ramus, it is ſpent on the correſponding lateral parts of the firſt two Toes.

352. The external anteriour Ramus of the ſmall Sciatic Branch, runs down betwixt the Fibula and the Peronæus Longus, and then between the Peronæus Medius and Extenſor Digitorum Longus; to which, and to the neighbouring Ligaments, it gives Filaments all the way to the upper ſide of the Foot.

353. In this courſe, having run along above two third parts of the Leg, and having reached the great annular Ligament, it runs forward and toward the Integuments, being there divided into two Portions, one of which goes to the great Toe, the other to the laſt Toes.

354. The firſt Portion of this Ramus gives a Nerve to the internal lateral part of the Great Toe, and is afterwards diſtributed to the neighbouring Integuments on the convex ſide of the Foot, and laſtly to the correſponding lateral parts of the Great and Second Toes.

355. The other Portion which goes to the laſt Toes, is firſt of all join'd to a Filament of the firſt Portion, and afterwards to another from the internal anteriour Ramus.

356. After this Union, they are preſently divided, and diſtributed to the laſt two Toes, and to the Integuments. One Filament ariſing from this Union, joins a Ramus belonging to the great Sciatic Branch.

*Nervi Sympathetici Maximi, vulgò Intercoſtales.*

357. It is the common Opinion, that each of the great Sympathetic Nerves begins by a Filament from the ſixth Pair belonging to the Medulla Oblongata, and by two Filaments from the fifth Pair; and that theſe Filaments do at firſt compoſe a very ſmall Nerve which runs backward, to go

out of the Cranium through the bony Canal of the Apophyſis Petroſa, and increaſes gradually in its courſe downward.

358. But having examined attentively the pretended Origin of theſe Filaments, they ſeem to me rather to aſcend from the Baſis of the Cranium with the internal Carotid, and to run from behind forward to join the fifth and ſixth Pairs; and I find the Angle formed by this Union to be turned forward, and withal ſo very acute, that theſe Nerves cannot be look'd upon as Recurrents.

359. And as I have ever ſince that time, that is, for twenty Years paſt, found this Angle diſpoſed the ſame way in all Subjects that I have diſſected; I have always been of opinion, that what had been taken for the original Root and deſcending Stem of the Nerve called Intercoſtalis, was really an aſcending Branch thereof, which as it enters the Cranium, is divided into Filaments, by which it becomes cloſely united with the two Pairs already named.

360. The Obſervation communicated to the Royal Academy by M. *Petit*, Doctor of Phyſick, concerning the different Size of the Portions of the ſixth Pair, appears to be indiſputable; he having found this Nerve larger on the fore part, between the Filament of the ſuppoſed Intercoſtal and the Orbit, than on the back part between the ſame Filament and the Origin of the ſixth Pair; and his Experiments concerning the real Co-operation of this Nerve in Viſion, are ſtill a farther Confirmation of his Obſervation.

361. These Nerves, as I have ſaid, are commonly called Intercoſtales, tho' this Name does not agree either with their Situation, or with the Extent of their Courſe, as we ſhall preſently ſee; and therefore I believe the name of Sympathetici Majores, or Maximi, will be more proper, becauſe of their frequent Communications with almoſt all the other principal Nerves of the Body.

362. The Situation of theſe two Nerves in general, is on the lateral parts of the whole twenty-four Vertebræ, immediately before the Roots of the tranſverſe Apophyſes, and likewiſe on the lateral Parts of the inſide of the Os Sacrum.

363. Through this large extent, they appear like two Ropes divided, and in a manner interſected at different diſtances, by a great number of gangliform Tubercles, by means of which they communicate backward with the Ganglions of the Medulla Spinalis, by ſhort collateral Filaments; and produce forward, all their particular Ramifications.

364. These Ganglions differ more or leſs from each other in Size, Colour and Conſiſtence; and may be look'd upon as ſo many Origins or Germina diſperſed through this great Pair of Nerves, and conſequently as ſo many little Brains. I ſhall ſpeak to them more particularly, in the Deſcription of the Head; and it will be ſufficient in this place to purſue their Diſtributions, and the Courſe of their Ramifications.

365. For this purpoſe, we need only conſider theſe Ganglions, in the ſame manner that we did the vertebral Nerves, as divided into Cervicalia, Dorſalia, Lumbaria, and Sacra, without pretending to determine the number contained in each Claſs.

366. The firſt Cervical Ganglion is the moſt conſiderable in Size, but not in Conſiſtence, repreſenting a ſoft oblong Tumour of the Figure of an Olive, and ſituated longitudinally before the Root of the tranſverſe Apophyſes of the three firſt Vertebræ, immediately behind the Pharynx.

367. It produces from its ſuperiour Extremity a ſmall ſoft Nerve, which runs up with the internal Carotid Artery of the ſame ſide, into the bony Canal of the Apophyſis Petroſa.

368. At its Entry into this Canal, it is divided into ſeveral Plexiform Filaments, which at that place ſurround the Carotid Artery, and accompany all the Incurvations thereof, till it enters the Cranium. They adhere very cloſely to the Artery, and both they and their Trunks are very tender, having oftentimes neither the Colour, nor Conſiſtence of nervous Filaments; for they are reddiſh, and ſometimes in a manner mucilaginous. We muſt not miſtake for theſe Plexiform Filaments, ſome lacerated Portions of the Dura Mater, which line this bony Canal.

369. Among theſe Filaments there are two or three principal ones, which appear to be only a ſimple Diviſion of the Trunk, and which, as they enter the Cranium, unite again into a ſmall Trunk, more ſolid than the former. The ſmall ſuperiour Trunk is immediately afterwards divided into Filaments, one of which is united to the Nerve of the ſixth Pair. the reſt join the fifth Pair, as has been already ſaid. The Filament which goes to the ſixth Pair, is commonly ſingle, but I have ſometimes found it double, or divided all the way to the Union.

370. Immediately below the inferiour Orifice of the bony Canal of the Apophyſis Petroſa, and from thence all the way down to the Occipital Condyle on the ſame ſide, or to the top of the firſt Ganglion, the ſmall aſcending Trunk is a little ſtronger, and not altogether ſo ſoft, as it is in the Canal.

371. The firſt Cervical Ganglion is of a middle Conſiſtence, and adheres very cloſely to the Trunk of the eighth Pair, or Nervus Sympatheticus Medius, by numerous ſmall communicating Filaments.

372. It likewiſe communicates on both ſides, by ſhort Branches, with the ninth and tenth Pairs of Nerves of the Medulla Oblongata; with the firſt, ſecond, and ſometimes the third Cervical Pairs; and alſo with that Branch, which the eighth Pair ſends to the Pharynx.

373. In its paſſage, it gives Filaments to the Pharynx, to the ſmall neighbouring Muſcles, and to the Carotid Artery, from which it receives very fine Capillary Veſſels, which are plainly viſible in Inflammations; and ſeem to form a curious Network, with the nervous Filaments.

374. Lastly, it ſends downward a very long nervous Filament, which runs in the Thorax, and joins other Filaments, of which hereafter.

375. This Ganglion terminates below, in a ſmall Rope or Trunk, which runs down on the anteriour vertebral Muſcles of the Neck, in the ſame Courſe with the eighth Pair, and the Carotid Artery of the ſame ſide; to both which it is connected by membranous Expanſions, as by a kind of Vagina, all the way to the laſt Vertebra of the Neck.

376. In this Courſe, the deſcending Trunk communicates on the outer or backſide with the third, fourth, fifth, and often with the ſixth Cervical Pairs, by ſhort Branches, more or leſs oblique, by which it ſeems to be gradually increaſed in Size.

377. At the Places of theſe communications, we obſerve ſmall Ganglions in this Trunk, which however, in ſome Subjects, are ſcarcely perceptible; and it is very difficult to determine, by which Extremity theſe Branches ariſe, and by which they are inſerted.

378. On the inner or foreſide, this Trunk gives off two or three Filaments, which run obliquely downward, toward the Aſpera Arteria, into the Thorax. Another Filament goes off, below the firſt Cervical Ganglion, which paſſes on the foreſide of the Carotid Artery, and joins a Filament of the eighth Pair, with which it forms a ſmall diſtinct Rope.

379. This ſmall Rope runs before the ſubclavian Vein, and lower down joins another Filament, which ariſes behind the ſubclavian Artery, and runs down in the manner hereafter to be explained, ſending off Filaments in its paſſage to the Œſophagus, and neighbouring Parts.

380. The Trunk having reached as far as the laſt Vertebra of the Neck, forms a ſmall Ganglion, called Ganglion Cervicale Infimum, which is pretty ſolid, and ſometimes double.

381. Presently afterwards, the Trunk turns from within outward, towards the Root of the firſt Rib, behind the ſubclavian Artery, where it forms a pretty large Ganglion, which is the firſt of the Thoracica or Dorſalia.

382. These two laſt mentioned Ganglions are very near each other, being ſeparated only by a very ſhort Portion of the Trunk, which is ſometimes double, and forms a kind of ſmall Plexus, behind the ſubclavian Artery.

383. From the Fore-part of the loweſt Cervical Ganglion, a ſmall nervous Rope goes out, which runs before the ſubclavian Artery, bends immediately downward, and ends in the Top of the firſt Dorſal Ganglion, forming by this Courſe a ſort of nervous Arch, which incloſes the ſubclavian Artery.

384. These two Ganglions communicate by ſhort Branches more or leſs oblique, with the neighbouring vertebral Nerves, that is, with the ſixth and ſeventh Cervical Pairs; and ſometimes with the fourth, by a long deſcending Filament. The firſt Dorſal Ganglion communicates likewiſe with the firſt Dorſal Pair of Nerves.

385. The loweſt Cervical, and ſometimes the firſt Dorſal Ganglion, ſends down a communicating Filament to the recurrent Nerve of the eighth Pair; and from this Union a Filament is detached, which paſſes behind the common Trunk of the Axillary and Carotid Arteries, joins another Filament from the eighth Pair, and contributes to the Formation of the Plexus Pulmonaris.

386. From the ſmall Plexiform Portion of the Trunk which joins the laſt Cervical and firſt Dorſal Ganglions, behind the ſubclavian Artery, a particular Filament goes out, which unites with the ſmall Trunk, common to the great Sympatheticus, and to the eighth Pair, and runs down before the ſubclavian Artery, and together with this Filament compoſes the Plexus Cardiacus.

387. On the right ſide, this Filament runs down to the right Ventricle of the Heart, and then between the Aorta and Arteria Pulmonaris, where it

communicates with ſome Filaments from the left Recurrent of the eighth Pair.

388. On the left ſide, a Filament goes out from the laſt Cervical, and another from the firſt Dorſal or Thoracic Ganglion, which unite together to form a kind of Arch, in which however, nothing is contained.

389. From this Arch a Nerve goes out, which runs down between the Curvature of the Aorta, and the left Branch of the Pulmonary Artery, where it communicates with a Filament of the eighth Pair, and forms a Gangliform Plexus, with the like communicating and united Filaments from the right ſide.

390. From this Gangliform Plexus, which may be look'd upon as the Origin of the Plexus Cardiacus ſuperior, a great number of Filaments run down, over the Trunks of the great Blood-Veſſels, and over the Auricles and Ventricles of the Heart.

391. The chief of theſe Filaments run in the Cellular Subſtance behind the Aorta, or between that and the Trunk of the Pulmonary Artery, where they are divided into a great many ſmall Nerves, which run before and behind the Aorta, to the Baſis and Auricles of the Heart.

392. The Filaments that run down from the Trunk it ſelf, between the firſt and laſt Cervical Ganglions, are united and interwoven in the Thorax, with the Filaments common to the laſt Cervical and firſt Dorſal Ganglions, and thus contribute to the Formation of the Plexus Cardiacus, and ſome part of the Plexus Pulmonaris.

393. The long Filament of the firſt Cervical Ganglion contributes likewiſe to theſe Plexus. It runs along the inſide of the Trunk, and then unites with the Filaments of the laſt Cervical Ganglion, the firſt Dorſal Ganglion, and the great Recurrent Nerve.

394. From all theſe Conjunctions a particular Nerve is formed in ſome Subjects, which meets a like Rope from the other ſide behind the Aorta; and forms, together with that, a kind of ſubordinate Trunk, about a Finger's breadth in length, which ſends out on all ſides ſeveral Filaments that are diſtributed to the neighbouring Parts.

395. From the firſt Dorſal Ganglion, the Trunk runs down on the foreſide of the Heads and Necks of all the Ribs, over the Articular Ligaments by which they are tied to the Vertebræ. On the laſt falſe Rib, it bends a little toward the Bodies of the Vertebræ.

396. In this Courſe, the Trunk forms a ſmall Ganglion, between each Rib, and communicates backward by two ſhort Filaments, more or leſs oblique, with the correſponding Dorſal or Coſtal Nerves.

397. Of theſe two communicating Filaments, one is more oblique and often ſmaller than the other; one runs backward, towards the neareſt Ganglion of the Coſtal Nerve, the other runs forward on the Head of the Rib, to the Trunk of the great Sympathetic Nerve; and for this reaſon, one of theſe Filaments appears to be more anteriour and longer than the others.

398. Having reached about half way between its Entry into the Thorax and the laſt Vertebra of the Back, this Trunk ſends commonly five

Branches, obliquely downward on the lateral and a little toward the anteriour Part of the Bodies of the Vertebræ.

399. The firſt four Branches come commonly from the fifth, ſixth, ſeventh and eighth Thoracic Ganglions, and the fifth ariſes from ſeveral of the following Ganglions. The firſt is the longeſt, and the laſt is the thickeſt.

400. All theſe Branches approach each other gradually in their Deſcent as far as the laſt Vertebra of the Back, where they unite into one large ſhort collateral Rope, which pierces the upper lateral part of the lower Muſcle of the Diaphragm, ſending ſome Filaments to the upper ſide.

401. Having got below the Diaphragm, and giving off ſome Filaments to the lower ſide of that Muſcle, this great Trunk produces behind the Glaudula Renalis, a kind of irregular Ganglion of a curve oblong Figure, called Ganglion ſive Plexus Semilunaris.

402. The convex ſide of this Semilunar Plexus or Ganglion, is turned obliquely backward and downward, the concave ſide forward and upward, one of its Cornua being turned upward, the other forward; ſo that the inferiour Cornua of the two Ganglions on each ſide, are turned toward each other.

403. These Ganglions on each ſide communicate together, behind the Stomach, on the Cæliac Artery, and likewiſe with the eighth Pair or Nervus Sympatheticus Medius, chiefly by means of the Nervus Stomachicus poſterior, belonging to that Pair.

404. From the reciprocal Communication of theſe two Semilunar Ganglions, a kind of middle Plexus is formed, which partly ſurrounds the Cæliac Artery, and is partly ſpent on the Meſocolon.

405. The Semilunar Ganglion on the right ſide, together with a large Portion of the Plexus Cæliacus, and ſome Filaments of the Plexus Stomachicus, form a particular Intertexture, called Plexus Hepaticus.

406. This Hepatic Plexus having communicated with ſome Filaments of the Diaphragmatic Nerve, produces ſeveral Filaments which ſurround the Hepatic Artery and Vena Portæ in form of a reticular Vagina, and accompany the Branches of theſe Veſſels through the whole Subſtance of the Liver. The Hepatic Plexus ſupplies likewiſe the Veſicula Fellis, Ductus Bilarii, Duodenum, Pancreas, and Glandulæ Renales.

407. The left Semilunar Ganglion, formed by the anteriour or collateral Trunk of the left ſide, produces ſeveral Rami, which form the Plexus Splenicus, nearly in the ſame manner as has been already mentioned.

408. This Plexus Splenicus, having communicated with the Hepaticus, and by the Intervention of the Plexus Stomachicus, with the eighth Pair, ſurrounds the ſplenic Artery, ſupplies the Pancreas, and is diſtributed to the Spleen.

409. This left Ganglion is ſometimes accompanied by another, which gives Filaments to the Spleen.

410. Each Semilunar Ganglion ſends Rami from its convex ſide, which being joined to the Filaments of the firſt Lumbar Ganglions, form an Intertexture called Plexus Renalis, which ſurrounds the renal Artery, is diſtributed

to the Kidneys, and Glandulæ Renales, and ſends out a Filament, which accompanies the ſpermatic Veſſels.

411. This Renal Plexus concurs likewiſe with the Semilunar Ganglion, in the Formation of the great Meſenteric Plexus, and communicates by ſeveral Filaments with the Plexus Coronarius Stomachicus.

412. The right Renal Plexus communicates particularly with the Plexus Hepaticus; and the left, with the Splenicus; and each of them, by two Filaments, with the true Trunk, on the ſide of the firſt two Vertebræ of the Loins. This Portion of the principal Trunk is commonly called the inferior Rope of the intercoſtal Nerve.

413. The right and left Semilunar Ganglions ſend Nervous Faſciculi to each other, which by a particular Intertexture form a kind of flat Ganglion or Plexus, immediately under the Diaphragm, before the Articulation of the laſt Vertebra of the Back with the firſt of the Loins.

414. From this Plexiform Union, called commonly Plexus Solaris, ſeveral Filaments are detached in a radiated manner to the Meſocolon and Meſentery; and ſome of them go likewiſe to the Diaphragm.

415. A great number of other Filaments go likewiſe from it, which with the Ramifications thereof, form a kind of nervous Capſula or Vagina, round the ſuperiour Meſenteric Artery, and round all its Ramifications on the Inteſtines, and ſupply the Meſenteric Glands. This is termed Plexus Meſentericus ſuperior, which comes chiefly from the Filaments of the Plexus Hepaticus and Renalis, and of the right Semilunar Ganglion.

416. The ſuperior Meſenteric Plexus ſends down from its Origin, along the Aorta, and behind the deſcending Portion of the Meſocolon, between the ſuperiour and inferiour Meſenteric Arteries, ſeveral Filaments or nervous Faſciculi differently interwoven, from which a nervous Vagina is likewiſe formed, that ſurrounds the inferiour Meſenteric Artery, and its Ramifications on the Inteſtines. This has been named Plexus Meſentericus inferior.

417. The deſcending nervous Faſciculi, between the two Meſenteric Arteries, which may be named Meſenterici Poſteriores, receive ſome communicating Filaments from both Plexus Renales, and likewiſe communicate with the Trunk of the great Sympathetic Nerve, by Filaments which run down obliquely from the Lumbar Ganglions. Afterwards they detach a Filament on each ſide, which accompanies the ſpermatic Veſſels.

418. The Faſciculi Meſenterici Poſteriores having produced the Plexus Meſentericus inferior, ſend other Filaments downward, over the Extremities of the Aorta, behind the inferiour Curvature of the Colon.

419. These inferiour Faſciculi or Filaments adhere ſtrongly to the neighbouring Parts of the Peritonæum, and together with other Filaments from both ſides of the Trunk, form a third Plexus, which may be called Infra-Meſentericus, or Hypogaſtricus.

420. This Hypogaſtric Plexus, at the extremity of the laſt Curvature of the Colon, on the foreſide of the laſt Vertebra of the Loins, is divided into two flat Ganglions which ſurround the beginning of the Inteſtinum Rectum backward, to which they are afterwards diſtributed, and alſo to the Bladder and

to the Spermatic Veſſels; and having communicated by lateral Filaments, with each Trunk of the great Sympathetic Nerve, they ſend Filaments to all the parts contained in the Pelvis.

421. The Trunk of the great Sympathetic Nerve having detached the five Rami which form the collateral Rope, becomes much ſmaller, and having reached the eleventh Vertebra of the Back, it approaches the collateral Trunk, and perforates the inferiour Muſcle of the Diaphragm.

422. Afterwards it runs more forward on the Bodies of the Vertebræ, and increaſes by the addition of Filaments from the laſt two Dorſal Pairs of Nerves.

423. It runs down between the Pſoas and neighbouring Tendons of the ſmall Muſcle of the Diaphragm, on the lateral parts of the Vertebræ Lumbares and anteriour ſide of the Os Sacrum.

424. At this place the right and left Sympathetic Trunks approach each other, and at the Extremity of the Os Sacrum, they form a communication in the manner of an inverted Arch.

425. In its paſſage, each Trunk receives commonly two Filaments from each Ganglion of the Nervi Lumbares and Sacri, and likewiſe forms ſmall Ganglions between each Vertebra, which ſend ſome Filaments to the neighbouring parts, and others which communicate with the Faſciculi of the Plexus Meſenterici.

426. The Pairs of Filaments which come from the two or three firſt Lumbar Ganglions, run a little downward, but the following run gradually upward; and it ought to be obſerved that capillary Blood-Veſſels are diſcernable between and upon the Filaments of each Pair.

427. The inverted Arch or inferiour Union of the two Trunks, gives off together with the two loweſt Nervi Sacri, ſeveral Filaments to the Rectum, Anus and Muſcles of the Coccyx.

428. Lastly, the great Sympathetic Nerve, from the firſt Vertebra of the Neck to the Extremity of the Os Sacrum, communicates by Filaments, with all the Vertebral Nerves, as has been already ſaid; but it muſt be obſerved, that in the Thorax, theſe communicating Filaments are very ſmall and ſlender, where the Sympathetic Trunk is largeſt; and that below the Diaphragm, they are ſtronger, becauſe there the Trunk diminiſhes, eſpecially on the Os Sacrum, where it is very ſmall. The ſame thing is to be obſerved concerning the Ganglions of the Trunk, the firſt Cervical Ganglion only excepted.

# SECT. VII.

## *A Compendious View of the Parts of the Human Body, and a Deſcription of the Common Integuments.*

### ART. I.

### *A View of the Parts of the Human Body.*

*Introduction.*

1. THE Human Body is compoſed of firm and liquid Parts, commonly called Solids and Fluids. Of the ſolid Parts, ſome are hard, others ſoft and flexible.

2. THE ſolid Parts are the chief Subject of Anatomy, properly ſo called; by which term, borrowed from the *Greek*, we underſtand not only an artful Decompoſition of the Parts of the Body, but alſo a methodical Demonſtration and Deſcription of the Parts when taken to pieces.

3. THE Hiſtory of the Fluid Parts comes into a Syſtem of Anatomy, only occaſionally, and by the bye; becauſe it properly belongs to what is called Phyſiology or the Animal Œconomy.

4. ANATOMISTS ordinarily reduce all the ſolid Parts under certain general Claſſes, expreſſed by the common or generical Names of Bone, Cartilage, Ligament, Fibre, Membrane, Veſſel, Artery, Vein, Nerve, Muſcle, Gland, Fat, Viſcus, Organ, *&c.*

5. THE Ancients who ſettled a general Diviſion of the Parts of the Human Body, from the meer outward appearance of their Structure, called ſome Similar or Simple, and the reſt Organical or Compound; but I look on theſe Terms only as ſo many Anatomical Words, which expreſs ſeveral parts that have nearly the ſame Structure to outward appearance; and as they are often mentioned, I ſhall here give an Explication of thoſe which are in moſt frequent Uſe.

*Explication of the general Terms of Anatomy.*

6. BY Bones, we mean in general the hardeſt, moſt ſolid, and moſt inflexible parts of the Human Body, the particular Hiſtory of which is contained in the Deſcription which I have given of the dry and freſh Bones.

7. A CARTILAGE is a whitiſh or pearl-coloured Subſtance, ſofter than a Bone, but harder than any other Part, ſmooth, poliſhed, pliable and elaſtic. I explained the Cartilages in the Deſcription of the freſh Bones.

8. A LIGAMENT is a white, fibrous, compact Subſtance, more pliable than a Cartilage, difficult to be broken or to be torn, and yielding but a very little when drawn out with force. The Ligaments have been explained at full length in the ſecond Section.

9. THE name of Fibre is given to ſmall Filaments which appear to be the moſt ſimple Parts of the Body, and which, by their different Diſpoſition and Connections, compoſe all the other parts. The Fibres themſelves

differ in Subſtance, being either membranous, fleſhy, tendinous or bony, in direction, being either ſtraight, oblique, longitudinal, tranſverſe, circular or ſpiral ; and in ſize, being either large, ſmall, long or ſhort.

10. By Membrane we underſtand a pliable Texture of Fibres diſpoſed or interwoven together in the ſame Plane. They differ in thickneſs according to the ſmallneſs of their Fibres and number of their Planes. Theſe particular Planes are termed Laminæ, and diſtinguiſhed into external, internal, middle, &c.

11. The difference of Membranes in general depends on that of the Fibres, of which they are compoſed. Small Portions of Membranes, eſpecially when they are very thin, are called Pelliculæ ; and ſome membranous Laminæ are united together by the intervention of a particular Subſtance, compoſed of this ſort of Pellicles, and called the cellular or ſpungy Subſtance.

12. Vessels are Tubes, Ducts or Canals, more or leſs flexible, compoſed of different Membranes, the Strata of which are generally termed Tunicæ or Coats. Some of them are divided into Branches, and theſe again into Rami and Ramifications, which gradually diminiſh, but ſtill remain hollow.

13. The general Deſign of the Veſſels is to contain Fluids from the Diverſity of which they are diſtinguiſhed into Blood-Veſſels, Vaſa Lactea, Lymphatica, &c The laſt and ſmalleſt Extremities of all ſorts of Veſſels are generally termed Capillaries.

14. The Blood-Veſſels are of two kinds, one of which receives the Blood from the Heart, and diſtributes it to all the parts of the Body, which are named Arteries ; the other brings the Blood from all the parts, back to the Heart, which are called Veins, and ſome of theſe have the name of Sinuſes.

15. The Arteries are thicker than the Veins, and may be diſtinguiſhed by this Mark in dead Bodies ; and in living Bodies they are known by a certain beating called the Pulſe. The Veins lie nearer the Surface of the Body than the Arteries, and are furniſhed with Valves, that is, with ſmall Membranous Sacculi, fixed at different diſtances to the ſides of their Cavities. The Openings of theſe Valves are broad, and turned toward that ſide where the Vein is largeſt, but their bottoms are turned the contrary way, to that ſide where the Veins are of the ſmalleſt Diameter. In ſome places theſe Valves are ſingle, in others double, triple, &c.

16. By Nerves, Anatomiſts mean the white Ropes which proceed from the Cerebrum, Cerebellum and ſpinal Marrow, and are ſpread over all the parts of the Body by Filaments and Ramifications.

17. Each Nervous Rope may be looked upon as a membranous Veſſel, the Cavity of which is filled by a great number of membranous longitudinal Septa, and by Medullary Filaments which lie betwixt the Septa.

18. Muscles are bundles of Fibres, called by Anatomiſts Fibræ Motrices, of a reddiſh colour, and of different lengths.

19. The middle Portion of the moving Fibres is the principal, and differs from the Extremities in being red, thick, ſoft, and capable of Contraction,

whereas the Extremities are white, ſmall, compact, and incapable of yielding.

20. This middle Portion of each moving Fibre is ſaid to be fleſhy, and they form what is properly called Fleſh. The Extremities are called Tendinous, and the Subſtance formed by them, Tendons.

21. Glands are Cluſters or Moleculæ, diſtinguiſhable from all the other parts of the Body, by their Form, Conſiſtence, Texture and Connexion.

22. They are in general made up of Arteries, Veins, Nerves, and other particular Veſſels, and of a Subſtance which unites all theſe together, in their different folds, contortions, and intertextures, all inveſted by a membranous covering.

23. The Office of Glands is to ſeparate from the Maſs of Blood, by means of certain ſecretory Veſſels, Fluids, which they diſcharge either immediately or by other Veſſels termed Excretory; and theſe Fluids are either accumulated in particular Reſervoirs, collected in the common Cavities, or forced out of the Body.

24. Fat and Marrow are equivocal Terms. By the firſt, we generally underſtand an oily, ſoft, white or yellowiſh Subſtance, of different Conſiſtences, collected between the Skin and the Muſcles, in the Interſtices of the Muſcles, about the Viſcera, *&c.* and compoſed partly of a cellulous or ſpungy Subſtance, and partly of an oily Matter of different Thickneſſes. This oily Matter is called Fat, eſpecially when ſeparated from the cellulous Subſtance, and likewiſe Corpus Adipoſum by Anatomiſts.

25. Marrow is one kind of Fat, and differs from it only in the fineneſs of the membranous Texture, in the Subtlety of the oily Matter, and in its Situation within the Bones. The word Marrow is equivocal in the ſame Senſe with the word Fat.

26. By Viſcera, we commonly underſtand Parts contained in a great Cavity, without being connected to it through their whole Extent or Circumference. Such are the Stomach, Inteſtines, *&c.* in the Abdomen, and the Lungs in the Thorax.

27. Organ or Inſtrument is a Term given to every part capable of any Function, whether it be ſimple or complex, and in this ſenſe we talk of the Organ of Sight, of Reſpiration, *&c.*

*General Diviſion of the Human Body.*

28. The Human Body is commonly divided into the Head, Trunk, and Extremities. The Trunk is again ſubdivided into the Neck, Thorax, and Abdomen; and the Extremities into ſuperiour, called the Arms, and inferiour, called the Legs.

29. The Ancients divided the Body into three great Cavities, which they termed Venters, and into four Extremities. They called the Head the upper Venter, the Thorax the middle Venter, and the Abdomen the lower Venter. The Neck was by ſome joined to the Head; by others, to the Thorax.

30. The moſt natural and plaineſt Diviſion of the Body, is into the Head, Neck, Thorax, Abdomen, Arms and Legs; each of which Portions may afterwards be ſubdivided.

31. EACH Portion is to be examined not only with regard to its Surface or external Conformation, but alſo with regard to its internal Structure or Compoſition, and to the Viſcera and Organs, which it contains or ſupports.

32. THIS is what gave occaſion to the Ancients to divide the Body into Parts containing, and Parts contained; and to ſubdivide the containing Parts into common and proper. The common containing Parts have been named Integuments, by which they meant chiefly the Skin and Fat.

*External Parts of the Head.*

33. THE Head viewed on the outſide, is divided into the hairy Scalp and Face.

34. THE hairy Scalp covers the upper part of the Os Frontis, the Oſſa Parietalia, the Os Occipitis, and the upper and lower Portions of the Oſſa Temporum.

35. THE uppermoſt Part of the hairy Scalp is termed the Vertex or Fontanella; the back part, Occiput; the lateral Parts, the Temples. The Vertex is diſtinguiſhed from the Occiput, by a contorted Border of Hair; and the Temples, by the Ears.

36. THE Arteries on each ſide of the hairy Scalp, are theſe:

Arteria Carotis Externa, in general.
Arteria Temporalis.
Arteria Occipitalis.
Arteria Angularis, by Communication.
Arteria Cervicalis Poſterior, by Communication.
Arteria Vertebralis, by Communication.
Arteria Carotis Interna, by Communication.

37. THE Veins on each ſide of the hairy Scalp, are theſe:

Vena Jugularis Externa, in general.
Vena Jugularis Externa Poſterior.
Vena Temporalis.
Vena Occipitalis.
Vena Vertebralis.
Vena Jugularis Externa Anterior, by Communication.
Vena Jugularis Interna, by Communication.
Sinus Lateralis Duræ Matris, by Communication.
Vena Axillaris, by Communication.
Vena Cephalica, by Communication.

38. THE Nerves on each ſide of the hairy Scalp, are theſe:

Nervi Sub-Occipitales, commonly called the tenth Pair from the Medulla Oblongata.
Par Nonum from the Medulla Oblongata.
Par Primum Cervicale.
Par Secundum Cervicale, by Communication.
Nervi Diaphragmatici, by Communication.
Ramus Frontalis of the Orbitary or Ophthalmic Nerve.

Nervus Sympatheticus Minor, called the Portio Dura of the Auditory Nerve.
Nervus Sympatheticus Medius, or Nerves of the eighth Pair from the Medulla Oblongata, by Communication.
Nervus Sympatheticus Maximus, commonly termed Intercoſtalis, by Communication.

39. The Face comprehends all that Portion of the Surface of the Head, which lies between the hairy Scalp, and the Neck, *viz.* the Fore-Head, Eye-Brows, Palpebræ, Eyes, Noſe, Mouth, Chin, Cheeks and Ears.

40. The External Parts of the Eye are theſe: The anteriour Portion of the Globe of the Eye, the Membrana Conjunctiva, the Cornea Lucida, Iris, Pupilla, Caruncula Lacrymalis, Angles of the Palpebræ; and the Cilia or Hairs of each Palpebra. The internal Parts are: The Globe of the Eye, the Tunica Sclerotica or Cornea Opaca, the Choroides, Arachnoides, Cryſtalline, Vitreous Humour, Aqueous Humour, the anteriour and poſteriour Chambers, the Muſcles, and the Optic Nerve.

41. The external Parts of the Ear, are theſe: The great Concha, the convex ſide of this Concha, or Hinder-part of the Ear, the great Border, the Fold or Helix, the Concavity, the broad Eminence or Anthelix, the ſmall anteriour Eminence or Tragus, the ſmall poſteriour Eminence or Antitragus, the Lobe or lower Extremity of the Ear, and the Meatus.

42. The external Parts of the Noſe, are theſe: The upper Extremity or Root of the Noſe, the Arch or Back, the Sides of that Arch, the Tip of the Noſe, the Alæ, the Nares and the Septum Narium. The internal Parts are the Cavity and Bottom of the Nares, the Convolutions, the maxillary, ſphenoidal and frontal Sinuſes.

43. The external Parts of the Mouth, are theſe: The Lips, one upper, the other lower, the Angles or Commiſſures of the Lips, the Border or Edge of each Lip, the Foſſula which runs from the Septum Narium to the Edge of the upper Lip, and the tranſverſe Fold which ſeparates the under Lip from the Chin.

44. The internal Parts of the Mouth, are theſe: The Palate, the Septum Palati, the Uvula, the Amygdalæ, Gums, Fræna of the Lips, the Tongue, its Apex, Root, Sides and Frænum. The other internal Parts of the Mouth, Eye, Noſe and Ear, ſuch as the Glands, Membranes, Muſcles, &c. muſt be referred to the particular Deſcriptions of theſe Parts.

45. The Cheeks are the lateral Parts of the Face, reaching downward from the Eyes and Temples, between the Noſe and Ears. The upper prominent Part of the Cheek, is commonly termed Mala.

46. The Chin is the anteriour Protuberance, by which the lower part of the Face is terminated, from whence it runs all the way to the Neck. This under part of the Chin, is termed the Baſis, and it is diſtinguiſhed from the Throat, by a tranſverſe Fold, which reaches from Ear to Ear. In the middle of the Chin, there is ſometimes a Foſſula or Depreſſion.

47. THE exteriour Arteries which belong to each ſide of the Face, are theſe:

Arteria Carotis Externa.
Arteria Carotis Interna, by Communication.
Arteria Vertebralis, by Communication.
Arteria Cervicalis, by Communication.

48. THE exteriour Veins diſtributed to each ſide of the Face, are theſe:

Vena Jugularis Externa.
Vena Jugularis Interna, by Communication.
Vena Vertebralis, by Communication.

49. THE exteriour Nerves ſpread on each ſide of the Face, are theſe:

Nervus Olfactorius.
Nervus Opticus.
Nervus Orbitarius ſive Ophthalmicus, which is the firſt Branch of the fifth Pair from the Medulla Oblongata.
Nervus Maxillaris Superior.
Nervus Maxillaris Inferior.
Nervus Trochlearis ſive Patheticus, which is the fourth Pair.
Nervus Motor Oculi Externus ſive Muſcularis Externus, which is the ſixth Pair.
Nervus Sympatheticus Minimus, or the Portio Dura of the Auditory Nerve.
Nervus Sympatheticus Medius, which is the eighth Pair.
Nervus Sympatheticus Maximus ſive Univerſalis, commonly called Intercoſtalis.
Nervus Hypogloſſus Major, which is the ninth Pair.
The ſecond Pair of the Nervi Cervicales.

50. THE Arteries of the Fore-Head, are theſe:

Arteria Temporalis, which is a Branch of the external Carotid.
Arteria Angularis, which is a Branch of the internal Carotid.
Arteria Carotis Interna, by Communication.

51. THE Veins of the Fore-Head, are theſe:

Vena Frontalis, formerly called Præparata.
Vena Temporalis.
Vena Angularis.
Sinus Orbitarius.
Sinus Longitudinalis ſuperior, by Communication.
Sinus Longitudinalis inferior, by Communication.
Vena Jugularis interna, by Communication.

52. THE Nerves of the Fore-Head, are theſe:

Nervus Orbitarius ſive Ophthalmicus, which is the firſt Branch of the fifth Pair from the Medulla Oblongata.

Nervus Maxillaris ſuperior.
Nervus Maxillaris inferior.
Nervus Sympatheticus minor, which is the Portio Dura of the Nervus Auditorius.

53. The Arteries which go to the Eye, are theſe :

Arteria Temporalis, which is a Branch of the external Carotid.
Arteria Maxillaris Externa ſive Angularis, which is a Branch of the external Carotid.
Arteria Maxillaris interna, which is a Branch of the external Carotid.
Arteria Carotis interna.

54. The Veins which belong to the Eye, are theſe :

Vena Temporalis, which is a Branch of the poſteriour external Jugular.
Vena Angularis, which is a Branch of the anteriour external Jugular.
Vena Frontalis, formerly named Præparata, which is a Branch of the anteriour external Jugular.
Sinus Orbitarius.
Sinus Longitudinalis, by Communication,
Vena Jugularis interna, by Communication.

55. The Nerves belonging to the Eye, are theſe:

Nervus Olfactorius, by Communication.
Nervus Opticus.
Nervus Motor communis, or the third Pair.
Nervus Trochlearis, or the fourth Pair.
Nervus Orbitarius ſive Ophthalmicus, a Branch of the fifth Pair.
Nervus Maxillaris ſuperior, a Branch of the fifth Pair.
Nervus Motor Externus.
Nervus Sympatheticus minor, or the Portio Dura of the Auditory Nerve.
Nervus Sympatheticus Maximus ſive Univerſalis, commonly called Intercoſtalis.

56. The Arteries diſtributed to the Noſe, are theſe :

The ſame Arteries with thoſe which go to the Eye, among which the internal Carotid ſupplies the Noſe, by Communication.
Arteria Labiorum Orbicularis, by Communication.

57. The Veins belonging to the Noſe, are theſe:

All the Veins already mentioned, as belonging to the Eye.

58. The Nerves which go to the Noſe, are theſe :

Nervi Olfactorii.

Nervus Orbitarius ſive Ophthalmicus, a Branch of the fifth Pair, both immediately, and by Communication.
Nervi Motores communes, or the third Pair, by Communication.
Nervi Maxillares ſuperiores, Branches of the ſixth Pair.
Nervus Sympatheticus Minimus.
Nervus Sympatheticus Medius, by Communication.

59. THE Arteries which go to the Ear, are theſe:

Arteria Temporalis, a Branch of the external Carotid.
Arteria Auricularis, a Branch of the Temporalis.
Arteria Occipitalis, by Communication.
Arteria Vertebralis, by means of the Arteria Baſilaris, which is a Continuation of it.
Arteria Carotis interna, by Communication with the Arteria Baſilaris.

60. THE Veins belonging to the Ear, are theſe:

Vena Temporalis.
Vena Occipitalis.
Vena Cervicalis.
Vena Maxillaris: Theſe three being Branches of the Jugularis externa.
Vena Jugularis interna, by ſeveral Communications.
Sinus Petroſus Duræ Matris.

61. THE Nerves diſtributed to the Ear, are theſe:

Nervus Maxillaris inferior, the third Branch of the fifth Pair.
Nervus Auditorius, the ſeventh Pair.
Nervus Sympatheticus minimus, the Portio Dura of the Auditory Nerve.
Nervus Hypogloſſus externus, the ninth Pair, by Communication.
Nervus Sub-Occipitalis, the tenth Pair, by Communication.
The ſecond Cervical Pair.
Nervus Sympatheticus Medius, the eighth Pair.
Nervus Sympatheticus Univerſalis, commonly called Intercoſtalis.

62. THE Arteries which go to the Mouth, Tongue, &c. are theſe:

The Artery of the Chin.
Arteria Coronaria ſive Orbicularis Labiorum, both being Branches of the external Carotid.
Arteria Maxillaris interna.
Arteria Sub-Lingualis.

63. THE Veins belonging to the Mouth, Tongue, &c. are theſe:

Vena Maxillaris externa.
Vena Maxillaris interna.

Venæ Raninæ. All theſe are Branches of the external Jugular.
Vena Jugularis interna, by ſeveral Communications.
Vena Gutturalis ſuperior, a Branch of the internal Jugular.
Vena Axillaris, when it ſends off the Guttural Vein.

64. The Nerves diſtributed to the Mouth, Tongue, and ſalivary Glands, &c. are theſe:

Nervus Maxillaris ſuperior.
Nervus Maxillaris inferior, both Branches of the fifth Pair.
Nervus Sympatheticus minimus, or Portio Dura of the Auditory Nerve.
Nervus Sympatheticus Medius, the eighth Pair.
The ninth Pair from the Medulla Oblongata.
The ſecond Pair of Cervical Nerves.
Nervus Sympatheticus maximus, by Communication.

65. The Cheeks on each ſide are furniſhed with Arteries and Veins from the neareſt Ramifications of the temporal and maxillary Arteries and Veins; and with Nerves from the Portio Dura of the auditory Nerve, and from the ſuperiour and inferiour maxillary Nerves.

*Parts of the Neck in general.*

66. The Neck in general is divided into the anteriour Part or Throat, and poſteriour Part or Nape. The Throat begins by an Eminence, and terminates by a Foſſula. The Nape begins by a Foſſula, which as it deſcends, is gradually loſt. The Neck contains the Larynx, a part of the Trachea Arteria, the Pharynx, a part of the Œſophagus, the Muſculi Cutanei, Sterno-Maſtoidæi, Sterno-Hyoidæi, Thyro-Hyoidæi, Omo-Hyoidæi, Splenius, Complexus, the Muſculi Vertebrales, which lie upon the firſt ſeven Vertebræ, and a Portion of the Medulla Spinalis.

67. The Arteries which go to the Neck, are theſe:

Arteriæ Carotides, in general.
Arteriæ Carotides externæ.
Arteriæ Carotides internæ.
Arteriæ Vertebrales.
Arteriæ Cervicales.

68. The Veins belonging to the Neck, are theſe:

Venæ Jugulares, in general.
Venæ Jugulares externæ.
Venæ Jugulares internæ.
Venæ Cervicales.
Venæ Vertebrales.

69. The Nerves diſtributed to the Neck, are theſe:

Nervi Sympathetici minimi, or the Portio Dura of the Auditory Nerves.
Nervi Sympathetici Medii, the eighth Pair.

Nervi Acceſſorii Octavi Paris.
The ninth Pair.
Nervi Sub-Occipitales, or the tenth Pair.
The ſeventh Cervical Pair.
Nervi Sympathetici Maximi.

*Parts of the Thorax.*

70. By the Thorax, we commonly underſtand all that part of the Body, which anſwers to the Extent of the Sternum, Ribs and Vertebræ of the Back, both outwardly and inwardly.

71. The Thorax is divided into the anteriour Part, called commonly the Breaſt, the poſteriour Part called the Back, and the lateral Parts called the right and left Sides.

72. The external Parts of the Thorax, beſides the Skin and Membrana Adipoſa, are principally the Mammæ, and the Muſcles which cover the Ribs, and fill the Spaces between them. In the Mammæ we ſee the Papillæ or Nipples, and a ſmall coloured Circle, which ſurrounds them. The Muſcles are the Pectorales Majores and Minores, Subclavii, Serrati Majores, Serrati Superiores Poſtici, Latiſſimi Dorſi, and Vertebrales, and to theſe we may add the Muſcles, which cover the Scapula.

73. The internal Parts of the Thorax are contained in the large Cavity of that Portion of the Trunk, which the Ancients called the middle Venter; but the Moderns name it ſimply, the Cavity of the Breaſt. This Cavity is lined by a Membrane, named Pleura, and divided into two lateral Cavities, by a membranous Septum named Mediaſtinum, which is a Production or Duplicature of the Pleura.

74. These Parts are the Heart, Pericardium, Trunk of the Aorta, great Arch of the Aorta, Trunks of the Carotid Arteries, ſubclavian Arteries, Trunks of the vertebral and axillary Arteries, the ſuperiour Portion of the deſcending Aorta, the intercoſtal Arteries, the Vena Cava ſuperiour, Vena Azygos, ſubclavian Veins, Trunks of the Jugular, vertebral and axillary Veins, a Portion of the Aſpera Arteria, and of the Œſophagus; the Ductus Lacteus, or Thoracicus, the Lungs, Pulmonary Artery, Pulmonary Veins, *&c.*

75. The Arteries and Veins, which particularly belong to the Thorax, are theſe:

Arteriæ & Venæ Thoracicæ, ſuperiores & inferiores.
Arteriæ & Venæ Mammariæ, internæ & externæ.
Arteriæ & Venæ Intercoſtales, ſuperiores & inferiores.
Arteriæ & Venæ Spinales, with the venal Sinuſes of the Canal of the Spine.

76. The Nerves diſtributed to the Thorax, are theſe.

Nervi Sympathetici Medii, or the eighth Pair.
Nervi Sympathetici Univerſales, commonly called Intercoſtales.
The laſt Cervical Pair.
The twelve Dorſal Pairs.
Nervi Diaphragmatici.

77. The Cavity of the Thorax is terminated downward, by the Diaphragm which parts it from the Abdomen.

*Parts of the Abdomen.*

78. The Abdomen begins immediately under the Thorax, and terminates at the Bottom of the Pelvis of the Oſſa Innominata. Its Circumference or outer Surface is divided into Regions, of which there are three anteriour, *viz.* the Epigaſtric or ſuperiour Region, the Umbilical or middle Region, and the Hypogaſtric or lower Region. There is but one poſteriour Region, named Regio Lumbaris.

79. The Epigaſtric Region begins immediately under the Appendix Enſiformis at a ſmall ſuperficial Depreſſion, called the Pit of the Stomach, and in adult Subjects ends above the Navel at a tranſverſe Line, ſuppoſed to be drawn between the laſt falſe Ribs on each ſide.

80. This Region is ſubdivided into three Parts, one middle, named Epigaſtrium, and two lateral, termed Hypochondria. The Epigaſtrium takes in all that Space which lies between the falſe Ribs of both ſides, and the Hypochondria are the places covered by the falſe Ribs.

81. The Umbilical Region begins in Adults, above the Navel, at the tranſverſe Line already mentioned, and ends below the Navel at another tranſverſe Line, ſuppoſed to be drawn parallel to the former, between the two Criſtæ of the Oſſa Ilium.

82. This Region is likewiſe divided into three Parts, one middle, which is properly the Regio Umbilicalis, and two lateral, called Ilia or the Flanks; and they comprehend the Space between the falſe Ribs and upper part of the Os Ilium on each ſide.

83. The Hypogaſtric Region is extended downward from the inferiour Limit of the Umbilical Region, and is divided into three Parts, one middle, called Pubis, and two lateral, called Inguina or the Groins.

84. The Lumbar Region is the poſteriour part of the Abdomen, and comprehends all that Space which reaches from the loweſt Ribs on each ſide, and the laſt Vertebra of the Back, to the Os Sacrum and neighbouring parts of the Oſſa Ilium. The lateral parts of this Region are termed the Loins, but the middle part has no proper name in Men.

85. Lastly, the Bottom of the Abdomen which anſwers to the Pelvis of the Sceleton, is terminated anteriourly by the Pudenda or Parts of Generation, and poſteriourly by the Clunes or Buttocks, and Anus. The Buttocks are ſeparated by a Foſſa which leads to the Anus, and each Buttock is terminated downward by a large Fold which diſtinguiſhes it from the reſt of the Thigh.

86. This Lumbar Region takes in likewiſe the Muſculus Quadratus Lumborum on each ſide, the lower Portions of the Sacro-Lumbares, of the Longiſſimi and Latiſſimi Dorſi, the Muſculus Sacer, &c.

87. The Space between the Anus, and the parts of Generation, is called Perinæum, and is divided into two equal lateral Parts by a very diſtinct Line, which is longer in Males than in Females, as we ſhall ſee in another place.

88. The Cavity of the Abdomen, formed by the Parts already mentioned, (all which are covered by the Skin and Membrana Adipoſa) is lined on the inſide by a particular Membrane, called Peritonæum. It is ſeparated from

the Cavity of the Thorax by the Diaphragm, and terminated below by the Muſculi Levatores Ani.

89. This Cavity contains the Stomach, and the Inteſtines, which are commonly divided into three ſmall, named Duodenum, Jejunum and Ilium; and three large, called Cæcum, Colon and Rectum. It contains likewiſe the Meſentery, Meſocolon, Omentum, Liver, Gall Bladder, Spleen, Pancreas, Glands of the Meſentery, Vaſa Lactea, Receptaculum Chyli, Kidneys, Renal Glands, Ureters, Bladder, and the internal Parts of Generation in both Sexes.

90. The principal Arteries of the Abdomen are theſe:

Arteria Epigaſtrica Superior, which is the loweſt Portion of the Mammaria Interna.
Aorta Inferior.
Arteria Cæliaca.
Arteria Meſenterica Superior.
Arteriæ Renales, called formerly Emulgentes.
Arteriæ Spermaticæ.
Arteria Meſenterica Inferior.
Arteriæ Lumbares.
Arteriæ Iliacæ.
Arteriæ Hypogaſtricæ.
Arteriæ Epigaſtricæ Inferiores.
Arteriæ Hæmorrhoidales.
Arteriæ Pudicæ.

91. The principal Veins of the Abdomen are theſe:

The inferiour Portions of the Venæ Mammariæ Internæ.
Venæ Renales.
Venæ Lumbares.
Venæ Spermaticæ.
Venæ Iliacæ.
Venæ Hypogaſtricæ.
Vena Portæ Ventralis.
Vena Portæ Hepatica.
Vena Meſaraica Major.
Vena Splenica.
Vena Meſaraica Minor ſive Hæmorrhoidalis Interna.

92. The principal Nerves of the Abdomen are theſe:

Nervi Stomachici, formed by the Extremity of the Sympathetici Medii or eighth Pair.
Nervi Sympathetici Maximi, the inferiour Portion.
The two Semilunar or Plexiform Ganglions.
Plexus Stomachicus.
Plexus Hepaticus.
Plexus Splenicus.

Plexus Renales.
Plexus Meſentericus Superior.
Plexus Meſentericus Inferior.
Nervi Lumbares.
Nervi Sacri.
Nervi Crurales, their Origin.
Nervi Sciatici, their Origin.

93. The whole Arm is divided, as in the Sceleton, into the Shoulder, the Arm properly ſo called, the Fore-Arm and the Hand. But to theſe we muſt here add the Stump of the Shoulder, the Axilla or Arm-pit, the Elbow, the Fold of the Arm, and the Hollow of the Hand.

*Parts of the upper Extremities.*

94. What is called the Stump of the Shoulder, is formed by the fleſhy Belly of the Muſculus Deltoides; and the Axilla, by the correſponding Edges of the Pectoralis Major and Latiſſimus Dorſi. The Elbow anſwers to the Olecranum; the Fold of the Arm is on the foreſide of the Articulation of the Os Humeri, with the Bones of the Fore-Arm, and the Hollow of the Hand is in the middle of the Palm.

95. The Arm, properly ſo called, is principally covered from the Shoulder downward, by the Biceps, Brachialis and the three Anconæi. The Fore-Arm is furniſhed with thoſe Muſcles which move the Radius on the Ulna, and the Carpus on the Fore-Arm. The Hand has few very conſiderable fleſhy Parts, except the Thenar and Hypothenar, between which the Hollow of the Hand is formed.

96. The Arteries of the whole upper Extremity are theſe:

Arteria Axillaris.
Arteria Humeralis.
Arteriæ Scapulares.
Arteria Articularis.
Arteria Brachialis.
Arteriæ Collaterales.
Arteria Cubitalis.
Arteria Radialis.
Arteria Interoſſea Anterior.
Arteriæ Interoſſeæ Poſteriores.
The arterial Arches in the Palm of the Hand.

97. The Veins of the whole upper Extremity are theſe:

Vena Cephalica Minor.
Vena Jugularis Externa, by communication with the ſmall Cephalica.
Vena Axillaris.
Venæ Muſculares.
Venæ Scapulares.
Vena Brachii Cephalica.
Vena Brachii Baſilica.
Venæ Satellites Arteriæ Brachialis.

Vena Profunda Superior.
Vena Mediana, *viz.* Mediana Cubitalis, Mediana Baſilica, Mediana Radialis ſive Cephalica, and Mediana Media or Major.
Vena Profunda Cubiti.
Vena Baſilica Cubiti ſive Cubitalis.
Vena Cephalica Cubiti ſive Radialis.
Venæ Cubiti Satellites.
Vena Cephalica Pollicis.
Vena Salvatella ſive Auricularis.
Areolæ Venoſæ Dorſi Manus.

98. THE Nerves of the whole upper Extremity, are theſe:

Nervi Brachiales in general, formed by the laſt four or five Cervical and firſt Dorſal Pairs.
Nervus Muſculo-Cutaneus.
Nervus Medianus.
Nervus Cubitalis.
Nervus Cutaneus Internus.
Nervus Radialis.
Nervus Axillaris ſive Articularis.

*Parts of the lower Extremities.*

99. THE lower Extremities of the whole Body are divided, as thoſe of the Sceleton, into the Thigh, Leg and Foot.

100. THE Thigh begins anteriourly on one ſide of the Fold of the Groin; and poſteriourly, a little above the lower half of the Buttock. It terminates anteriourly at the Patella on the Knee, and poſteriourly at the Poples or Ham. It is formed chiefly by the Muſcles which ſurround the Os Femoris, and are themſelves inveſted by the Faſcia Lata, *viz.* the Glutæus Maximus, two Vaſti, Crureus, Biceps, Triceps, Semi-Membranoſus, Semi-Tendinoſus, Gracilis Internus, Gracilis Anterior or Rectus and Sartorius.

101. THE Leg has but very few Muſcles on the fore-part, but a great many large ones behind; where the Gaſtrocnemii and Soleus form a kind of Belly, called the Calf of the Leg. The Leg begins anteriourly at the Knee, below the Patella, and poſteriourly at the Poples; and it terminates below, at the Ankles.

102. BESIDES the parts of the Foot mentioned in the Deſcription of the Sceleton, that convex part near its Articulation with the Leg is termed the Neck of the Foot; and the under Part, which is the Baſis of the whole lower Entremity, the Sole of the Foot. The fleſhy Parts are not more conſiderable on the Foot than on the Hand.

103. THE Arteries of the whole lower Extremity are theſe:

Arteria Obturatrix, a Branch of the Hypogaſtrica.
Arteria Glutæa, a Branch of the Hypogaſtrica.
Arteria Sciatica, by Communication.
Arteria Pudica, by Communication.
Arteria Cruralis.
Arteria Poplitea.

Arteria Tibialis Anterior.
Arteria Tibialis Poſterior.
Arteria Peronæa.
Arteria Plantaris.

104. The Veins of the whole lower Extremity are theſe:

Vena Obturatrix.
Vena Glutæa.
Vena Cruralis.
Vena Magna Saphena.
Vena Sciatica.
Vena Parva Saphena ſive Saphena Externa.
Vena Poplitea.
Vena Tibialis.
Vena Peronæa.
Vena Plantaris.

105. The Nerves of the whole lower Extremity are theſe:

Nervus Cruralis, formed by a Complication of the five Lumbares, eſpecially of the firſt four.
Nervus Sciaticus, formed by the Union of the laſt two Lumbares, and firſt three Sacri.
Nervus Sympatheticus Maximus, by Communication with the Nervi Lumbares and Sacri.
Nervus Popliteus.
Nervus Sciaticus Internus ſive Popliteus Internus.
Nervus Sciaticus Externus ſive Popliteus Externus.
Nervus Plantaris Externus.
Nervus Plantaris Internus.

## ART. II.

## *A Deſcription of the Common Integuments of the Body.*

106. ALL the parts of the Human Body are inveſted by ſeveral common and univerſal Coverings, to which Anatomiſts give the name of Integuments. *Introduction.*

107. There have been many Diſputes about the Number of theſe Integuments. The Ancients reckoned up five, *viz.* the Epidermis, Skin, Membrana Adipoſa, Panniculus Carnoſus, and Membrana Muſculorum Communis.

108. The firſt three of theſe Coverings are truly common or univerſal, that is, extended over all Parts of the Body; but properly ſpeaking, they ought to be reduced to two, for I look upon the Epidermis rather as a part or an Epiphyſis of the Skin, than as an Integument.

109. The two other Coverings mentioned by the Ancients, are not univerſal, but confined to particular Parts of the Body.

## § 1. *The Skin.*

110. The Skin is a Subſtance of very large Extent, made up of ſeveral kinds of tendinous, membranous, vaſcular and nervous Fibres, the Intertexture of which is ſo much the more wonderful as it is difficult to unfold; for their Directions are as various as thoſe of the Stuff of which an Hat conſiſts.

111. This Texture is what we commonly call Leather, and it makes, as it were, the Body of the Skin. It is not eaſily torn, may be elongated in all Directions, and afterwards recovers itſelf, as we ſee in fat perſons, in Women with Child, and in Swellings; and it is thicker and more compact in ſome Places, than in others.

112. Its Thickneſs and Compactneſs are not however, always proportionable; for on the poſteriour Parts of the Body, it is thicker and more lax than on the Fore-parts; and on the Palms of the Hands, and Soles of the Feet, it is both very thick, and very ſolid. It is generally more difficult to be pierced by pointed Inſtruments, in the Belly, than in the Back.

113. The outer Surface of this Subſtance is furniſhed with ſmall Eminences, which Anatomiſts have thought fit to call Papillæ, in which the capillary Filaments of the Cutaneous Nerves terminate by ſmall radiated Pencils.

114. These Papillæ differ very much in Figure and Diſpoſition, in the different Parts of the Body, and they may be diſtinguiſhed into ſeveral kinds.

115. The greateſt part of them is flat, of different Breadths, and ſeparated by Sulci, which form a kind of irregular Lozenges. The Pyramidal Figure aſcribed to them, is not natural, and appears only when they are contracted by Cold, by Diſeaſes, by boiling or by ſome other artificial Preparation which alters their ordinary Structure.

116. The Papillæ of the Palm of the Hand, of the Sole of the Foot, and of the Fingers and Toes, are higher than on the other Parts of the Body; but they are likewiſe ſmaller, cloſely united together, and placed as it were, endwiſe, with reſpect to each other, in particular Rows, which repreſent on the Skin all kinds of Lines, ſtreight, crooked, waving, ſpiral, &c. Theſe ſeveral Lines are often diſtinctly viſible in thoſe Parts of the Palm of the Hand, which are next the firſt Phalanges of the Fingers.

117. The Red part of the Lips is made up of Papillæ, repreſenting very fine Hairs or Villi cloſely united together.

118. There is another particular kind under the Nails; the Papillæ being there more pointed, or in a manner, conical, and turned obliquely toward the Ends of the Fingers. Thoſe which are found in the hairy Scalp, Scrotum, &c. are ſtill of other kinds.

119. The Papillæ of the firſt and ſecond kinds appear to be ſurrounded at their Baſes, by a ſoft mucilaginous and pretty viſcid Subſtance, which fills the Interſtices between them, and repreſents a kind of Net-work or Sieve, the Maſhes or Holes of which ſurround each Papilla. This Subſtance is commonly called Corpus Reticulare or Mucoſum.

120. The Origin of this Reticular or Mucous Body, has not hitherto been ſufficiently explained, and it has not been determined, whether it forms an univerſal Integument, or whether it belongs more properly to the Skin, than to the Papillæ or Epidermis.

121. To demonſtrate this Reticular Subſtance in public Courſes, the common Method is to take the boil'd Tongues of Oxen or Sheep; but this Method is fallacious, and may lead the greateſt number of the Spectators into Miſtakes, as I ſhall ſhow in another Place.

122. In Inflammations we obſerve a reticular Texture of capillary Veſſels, more or leſs extended on the Surface of the Skin; and curious Anatomiſts demonſtrate the ſame thing, by fine Injections, which may be look'd upon as artificial Inflammations. But neither of theſe Methods proves that in the natural State, theſe Veſſels are Blood-Veſſels, that is, that they contain the red Portion of the Blood.

123. It is more probable that this vaſcular Texture is only a Continuation or Production of the very ſmall Capillaries of the Arteries and Veins, which in the natural State tranſmit only the ſerous Part of the Blood, while the red Part continues its Courſe through wider Ramifications, which more properly retain the name of Blood-Veſſels.

124. This vaſcular Texture is of various Forms and Figures in the different Parts of the Body. It is not the ſame in the Face, with what it is elſewhere, neither is it alike on all the Parts of the Face, as may be diſcovered by the moſt ordinary Microſcopes; and from hence we might perhaps be enabled to give a reaſon, why one part of the Body turns red, more eaſily than another.

125. The inner Surface of the Skin is covered by very ſmall Tubercles, called commonly Cutaneous Glands, and they are likewiſe termed Glandulæ Miliares, becauſe of ſome Reſemblance which they are ſuppoſed to bear to Millet-Seeds.

126. These Tubercles are partly fixed in ſmall Foſſulæ, in the Subſtance of the Skin, which anſwer to the ſame number of ſmall Cavities, in the Corpus Adipoſum. Their excretory Ducts open on the outer Surface of the Skin, ſometimes in the Papillæ, and ſometimes on one ſide of them, as may be ſeen in the Ends of the Fingers, even without a Microſcope.

127. The greateſt part of them furniſhes Sweat, and others a fatty, oily Matter of different Thickneſſes, as in the hairy Scalp, in the Back, behind the Ears, and at the lower part of the Noſe, where this Matter may be ſqueezed out, in form of ſmall Worms. On the Head, this is called the Dandriff, and Filth or Naſtineſs on the other Parts of the Body.

128. By macerating the Skin in Water, or in any other proper Liquor, theſe Corpuſcles become more viſible, eſpecially in the Skin of the lower part of the Noſe, and of the Axilla. The late M. *Duvernay* demonſtrated to the Royal Academy, that the Structure of ſome of theſe Cutaneous Glands reſemble the Circumvolutions of ſmall Inteſtines plentifully ſtored with Capillary Veſſels. The illuſtrious M. *Morgagni* Profeſſor at *Padua* has given

the name of Glandulæ Sebaceæ to thoſe which furniſh the unctuous Matter abovementioned.

129. Besides theſe Corpuſcles, there are other ſmall ſolid Bodies, almoſt of an oval figure, contained in the Subſtance of the Skin, Theſe are the Roots or Bulbs from whence the Hairs ariſe, and ſome of them are ſituated within the inner Surface of the Skin, as I ſhall ſhew hereafter.

130. The Skin has ſeveral conſiderable Openings, ſome of which have particular Names; ſuch as the Fiſſure of the Palpebræ, the Nares, the Mouth, the external Foramen of the Ears, the Anus and Openings of the Parts of Generation

131. Besides theſe, it is perforated by an infinite number of ſmall Holes, called Pores, which are of two kinds. Some are more or leſs perceivable by the naked Eye; ſuch as the Orifices of the milky Ducts of the Mammæ, the Orifices of the excretory Canals of the Cutaneous Glands, and the Paſſages of the Hairs.

132. The other Pores are imperceptible to the naked Eye, but viſible through a Microſcope; and their Exiſtence is likewiſe proved by the Cutaneous Tranſpiration, and by the Effects of Topical Applications; and from theſe two Phænomena, they have been divided into arterial and venal Pores.

133. We ought likewiſe to obſerve the Adheſions and Folds of the Skin. It is every where united to the Corpus Adipoſum, as ſhall be ſaid hereafter; but it adheres to it much more cloſely in ſome Parts, than in others, as in the Palm of the Hand, Sole of the Foot, Elbow and Knee.

134. Some Plicæ or Folds in the Skin, depend on the Structure of the Membrana Adipoſa or Cellularis, as thoſe in the Neck and Buttocks; others do not depend on that Membrane, ſuch as the Rugæ in the Forehead, Palpebræ, *&c.* which are formed by Cutaneous Muſcles, and diſpoſed more or leſs in a contrary Direction to theſe Muſcles. Theſe Folds increaſe with Age.

135. There is beſides, a particular kind of Folds in the Skin of the Elbow, Knee, and Condyles of the Fingers and Toes, which are owing neither to the Conformation of the Membrana Adipoſa, nor to any Muſcle.

136. Lastly, there is a kind of Plicæ, or rather Lines, which croſs the Palm of the Hand, Sole of the Foot, and correſponding Sides of the Fingers and Toes in different Directions. Theſe ſerve for Imployment to Fortune-tellers, whoſe pretended Art is contrary to Religion, and deſpiſed by all Men of Senſe.

## § 2. *The Cuticula or Epidermis.*

137. The outſide of the Skin is covered by a thin tranſparent Web, cloſely joined to it, which is called Epidermis, Cuticula or the Scarf-Skin.

138. The Subſtance of the Cuticula appears to be very uniform on the ſide next the Skin, and to be compoſed on the other ſide, of a great number of very fine ſmall ſquammous Laminæ, without any appearance of a fibrous

or vaſcular Texture, except ſome ſmall Filaments by which it is connected to the Papillæ, and which perhaps are detached from thence.

139. This Subſtance is very ſolid and compact, but yet capable of being extended and thicken'd, as we ſee by ſteeping it in Water, and by the Bliſters raiſed on the Skin by Veſicatories, or any other means; and from thence it would ſeem, that it is of a ſpungy Texture. It yields very much in Swellings; but not ſo much as the Skin, without breaking or cracking.

140. The Origin of the Epidermis is as obſcure, as its Regeneration is evident, ſudden and ſurpriſing; for let it be deſtroyed ever ſo often, it ſtill grows again. It probably ariſes from a Subſtance that tranſudes from the Papillæ, and therefore the Ancients were in the right to call it an Efflo-reſcence of the Skin.

141. We muſt not however imagine, that it is the Air which dries this mucilaginous Matter, and gives it the form of the Epidermis; becauſe it is found equally in the Fœtus, which ſwims continually in Water; and it grows even on the Palate when it has been deſtroyed by too hot Food; and under Plaiſters applied to any Part of the Body.

142. Hard and reiterated Frictions looſen it inſenſibly, and preſently afterward, a new Stratum ariſes, which thruſts the firſt outward, and may itſelf be looſened, and thruſt outward by a third Stratum, and ſo on.

143. It is nearly in this manner, that Calloſities are formed on the Feet, Hands, and Knees; and the ſeveral Laminæ or Strata obſervable at the ſame time, on many other Parts of the Body, are owing to the ſame Cauſe, tho' many Anatomiſts have look'd upon them to be natural. It muſt be acknowledged, however, that on the Palms of the Hands, and Soles of the Feet, the Epidermis is commonly thicker than on any other Part.

144. The Epidermis adheres very cloſely to the Cutaneous Papillæ, from which it may be ſeparated by boiling; or which is a much better way, by ſteeping for a long time, in cold Water. It is not impoſſible to ſeparate it with the Knife, but this Management teaches us nothing of its Structure.

145. It adheres ſtill cloſer to the Corpus Reticulare, which is eaſily raiſed along with it; and they ſeem to be true Portions or Continuations of each other.

146. It is generally believed, that the Colour of the Epidermis is naturally white; and that the apparent Colour thereof, is owing to that of the Corpus Mucoſum. But when we examine ſeparately the Epidermis of Negroes, we find no other Whiteneſs in it, than in a thin tranſparent Lamina of black Horn.

147. The Epidermis covers the Skin thro' its whole Extent, except at the Places where the Nails lie. It is mark'd with the ſame Furrows and Lozenges as the Skin, and has the ſame Openings and Pores; and tho' it may be ſaid to paſs the Bounds of the Skin, where it is continued inward, thro' the great Openings, yet at theſe Places it loſes the name of Epidermis.

148. When we examine narrowly the ſmall Pores or Holes, through which the Sweat paſſes, the Epidermis ſeems to enter theſe, in order to compleat the excretory Tubes of the Cutaneous Glands. The Foſſulæ of the

Hairs have likewiſe the ſame Productions of the Epidermis, and it ſeems to give a ſort of Coat or Bark to the Hairs themſelves. Laſtly, the almoſt imperceptible Ducts of the Cutaneous Pores, are lined by it.

149. Having macerated the Skin for a long while in Water, the Epidermis, with all its Elongations, may be ſeparated from it; and in that caſe theſe Productions carry along with them, the Hairs, the Bulbs, aud even the axillary Glands.

150. By this Obſervation, we may explain, how Bliſters may remain for a long time on the Skin, without giving paſſage through theſe Holes, to the Matter which they contain, which Holes ought to be increaſed, one would think, by this Dilatation and Tenſion of the Epidermis.

151. For when the Epidermis is ſeparated from the Skin, it carries along with it ſome Parts of theſe Cutaneous Fibres, which being compreſſed by the Matter contained in the Bliſter, ſhut the Pores of the ſeparated Epidermis, like ſo many Valves; and it is probably theſe ſmall Portions which have been taken for Valves of the Cutaneous Tubes.

### § 3. *Uſes of the Skin.*

152. It is chiefly and properly the filamentary Subſtance, called the Body of the Skin, which is the univerſal Integument of the Body, and the Baſis of all the other Cutaneous Parts, each of which has its particular Uſes.

153. The Skin is able to reſiſt external Injuries to a certain Degree, and ſuch Impreſſions, Frictions, Strokes, *&c.* to which the Human Body is often liable, as would hurt, wound and diſorder the Parts of which it is compoſed, if they were not defended by the Skin.

154. The Papillæ are the Organ of Feeling, and contribute to an univerſal Evacuation, called inſenſible Tranſpiration. They likewiſe ſerve to tranſmit from without, inwards, the ſubtle Particles or Impreſſions of ſome things, applied to the Skin. The firſt of theſe three Uſes depends on the Extremities of the Nerves, the ſecond on the arterial Productions, and the third on the Productions of the Veins.

155. The Cutaneous Glands ſecrete an oily Humour of different Conſiſtences, and they are likewiſe the Origin of Sweat. But without the Epidermis, both Papillæ and Glands would be diſturbed in their Functions, on which great Diſorders muſt enſue.

156. In order to explain the Mechaniſm of Feeling, or of the Touch, we ſhould firſt be made acquainted with the Senſes in general, for which this is not a proper place; and therefore all that I ſhall obſerve here, is, that there are at leaſt two Sorts of Feeling, one general, the other particular.

157. Particular Feeling is accompanied with a certain determinate Impreſſion, by which we are enabled to diſcern Objects in a very diſtinct Manner, and this is properly what is called the Touch; the proper Organ of which is at the inſide of the Ends of the Fingers. General Feeling is indeterminate and indiſtinct, not being accompanied with the ſame Impreſſion as the former.

158. These Differences in the Senſe of Feeling, depend on thoſe of the Papillæ, which, in effect, appear to be more cloſe, and made up of a greater number of nervous Filaments at the Ends of the Fingers, than any where elſe; for the nervous Ropes that go to the Fingers, are proportionably larger than thoſe that go to any other Part of the Body.

159. The Epidermis ſerves to keep the Pencils or nervous Filaments of the Papillæ, in an even Situation, and without Confuſion, and it likewiſe moderates the Impreſſions of external Objects. Particular as well as general Feeling is more or leſs perfect, in proportion to the Thinneſs of the Epidermis, Calloſities in which, weaken and ſometimes deſtroy both.

160. Another Uſe of the Epidermis is to regulate the Cutaneous Evacuations already mentioned, the moſt conſiderable of which is inſenſible Tranſpiration. By this we underſtand a fine Exhalation, or a kind of ſubtle Smoke, which flows out of the Body imperceptibly, and in different Quantities. It might be called Cutaneous Tranſpiration, to diſtinguiſh it from Pulmonary Tranſpiration, of which hereafter.

161. This Cutaneous Exhalation becomes ſenſible, by applying the End of the Finger, or Palm of the Hand, to the Surface of a Looking-Glaſs, or of any other poliſhed Body; for it preſently looks dull and appears to be covered with a condenſed Vapour. It ſeems to me, that the convex Side of the Hand and Fingers, do not furniſh ſo great a Quantity of this Exhalation, as the Palm of the Hand, and the Inſides of the Fingers, eſpecially the Extremities, which points out one Uſe of this Tranſpiration, *viz.*. to keep the nervous Filaments in due order for particular Feeling.

162. Another Proof of inſenſible Tranſpiration, is the famous Experiment of *Sanctorius*, continued for thirty Years without Interruption, by which he found that this Evacuation in one Day, was equal to all the ſenſible Evacuations for fifteen Days.

163. This Calculation is not agreeable to what has been made in other Countries, particularly thoſe from the like Experiments made by M. *Dodart* and *Morin* of the Royal Academy of Sciences, and by Dr. *James Keil*, as publiſhed in his *Statica Britannica.* Neither can the Ballance inform us, whether the Cutaneous Tranſpiration is greater or leſs than the Pulmonary.

164. A long time ago, I diſcovered a Method to render this Tranſpiration viſible, to the diſtance of about half a Foot from the Body, and I mentioned it in a Theſis printed at *Copenhagen.* If we look at the Shadow of a bare Head on a white Wall, in a bright Sun-ſhiny Day, and in the Summer-Seaſon, we will perceive very diſtinctly the Shadow of a flying Smoke, riſing out of the Head, and mounting upward, tho' we cannot ſee the Smoke itſelf. We may try the ſame Experiment with a Dog or Fowl, *&c.*

165. It is much in the ſame manner, that the inviſible Exhalations from burning Charcoal throw a very diſtinct Shadow; and that the inviſible Smoke of a Chafing-Diſh, Warming-Pan, Stove, *&c.* make all diſtant Objects appear trembling, when veiw'd either over or on either Side of thoſe Utenſils.

166. The inſenſible Cutaneous Evacuation is performed ſimply, and without any Artifice, through the ſmall Pores already mentioned, much in the ſame manner as we obſerve the Smoke to ariſe from the Intrails of an Animal newly killed and opened. It is a particular and continual Diſcharge of the Serum of the Blood through the capillary Veſſels of the Skin.

167. It is naturally very moderate, and it is more abundant in the Summer, before a good Fire, after ſtrong Exerciſe, and during the Diſtribution of the Chyle; than in the Winter, in cold Places, during Inaction, and before Meals.

168. The tranſpired Matter appears to be in ſome degree ſaline, as may be obſerved by applying the Tongue to the Palm of the Hand, when it has not been waſhed lately before. This is perhaps the Reaſon, why we feel leſs Pain when a Wound is touched with the Finger cover'd with Silk, than with the naked Finger; but this Inconveniency might eaſily be prevented by waſhing the Hands and Fingers very well, immediately before we begin to dreſs Wounds.

169. The Matter of the other two Cutaneous Evacuations, the Sweat and thick oily Subſtance, comes chiefly from the Glands of the Skin. Each of them differs according to the different Parts of the Body where they are found, as may be obſerved both of the Filth and Sweat of the Head, Armpits, Hands, Feet, *&c.*

170. This Filth or Naſtineſs of the Skin, is an unctuous or fatty Matter, collected inſenſibly on the Epidermis, where it thickens and forms a ſort of Varniſh, which in time becomes prejudicial, by ſtopping up the Paſſages of Cutaneous Tranſpiration.

171. This Collection is more readily made in Winter, than in Summer; and this is the Reaſon why it is more difficult to keep the Hands clean in cold, than in warm Weather. And while I am diſſecting in Winter, the oftner I waſh my Hands, the leſs ſenſible they are of Cold.

## §. 4. *The Membrana Adipoſa, and Fat.*

172. The ſecond univerſal Integument of the Human Body, is the Membrana Adipoſa, or Corpus Adipoſum. This is not, however, a ſingle Membrane, but a Congeries of a great number of membranous Laminæ, joined irregularly to each other at different Diſtances, ſo as to form numerous Interſtices of different Capacities, which communicate with each other. Theſe Interſtices have been named Cellulæ, and the Subſtance made up of them, the cellulous Subſtance.

173. The Thickneſs of the Membrana Adipoſa, is not the ſame all over the Body, and depends on the Number of Laminæ, of which it is made up. It adheres very cloſely to the Skin, runs in between the Muſcles in general, and between their ſeveral Fibres in particular, and communicates with the Membrane, which lines the Inſide of the Thorax and Abdomen.

174. This Structure is demonſtrated every Day by Butchers, in blowing up their Meat, when newly killed; in doing which, they not only ſwell the

Membrana Adipoſa, but the Air inſinuates itſelf likewiſe in the Interſtices of the Muſcles, and penetrates even to the Viſcera, producing a kind of artificial Emphyſema.

175. These cellular Interſtices are ſo many little Bags or Satchels, filled with an unctuous or oily Juice, more or leſs liquid, which is called Fat, the different Conſiſtence of which depends not only on that of the oily Subſtance, but on the Size, Extent and Subdiviſion of the Cells.

176. It is generally known, that the illuſtrious *Malpighi* took a great deal of Pains about this Subſtance; that in Birds and Frogs, the Viſcera and Veſſels of which are tranſparent, he thought he ſaw a kind of Ductus Adipoſi; and that by preſſing theſe Ducts, he obſerved oily Drops to run diſtinctly into the ſmall Ramifications of the Vena Portæ.

177. The Manufacture of Soap, the Compoſition of the Unguentum Nutritum, and the different Mixtures of Oils with ſaline and acid Liquors, give us ſome Idea at leaſt, of the Formation of the Fat in the Human Body; but the Organ which ſeparates it from the Maſs of Blood, which ought to be the Subject of our preſent Inquiry, is not as yet ſufficiently known.

178. Fat is more fluid in living, than in dead Bodies. It melts with the Heat of the Fingers in handling it, and its Fluidity is in part obſtructed by the Sacculi, which contain it. To take it intirely out of theſe Bags, the Method is to ſet the whole over the Fire, in a proper Veſſel; for then the Bags burſt, and ſwim in Cluſters in the true oily Fluid.

179. This Subſtance increaſes in Quantity in the Body, by Reſt and good Living; and on the contrary, diminiſhes by hard Labour, and a ſpare Diet. Why Nouriſhment ſhould have this Effect, is eaſily conceived, and it is likewiſe eaſy to ſee, that an idle ſedentary Life muſt render the Fat leſs fluid, and conſequently more capable of blocking up the Paſſages of inſenſible Tranſpiration, through which it would otherwiſe run off.

180. Hard Labour diſſolves it, and conſequently fits it for paſſing out of the Body, with the other Matter of inſenſible Tranſpiration. Some are of opinion, that it returns into the Maſs of Blood, by the capillary Veins, and that it can, for ſome certain time, ſupply the Want of Nouriſhment.

181. By this, they think, the long Abſtinence of ſome Animals may be explained; but I am apt to believe, that the mere Decreaſe of Cutaneous Tranſpiration, occaſion'd by the continual Reſt and Inaction of theſe Animals, has a great ſhare in this Effect.

182. The proportional Differences, in the Thickneſs of this Membrana Adipoſa, are determined, and may be obſerved to be regular in ſome Parts of the Body, where either Beauty or Uſe required it.

183. Thus we find it in great Quantities, where the Interſtices of the Muſcles would otherwiſe have left diſagreeable hollow or void Places; but being filled, and as it were padded with Fat, the Skin is raiſed, and an agreeable Form given to the Part.

184. The Appearance of a Perſon moderately fat, of a Perſon extreamly lean, and of a dead Carcaſs, from which all the Fat has been removed, proves ſufficiently what I have ſaid.

185. In ſome parts of the Body the Fat ſerves for a Cuſhion, Pillow or Mattreſs, as on the Buttocks, where the Laminæ and Cells are very numerous. In other parts, this Membrane has few or no Laminæ, and conſequently little or no Fat, as on the Fore-head, Elbows, *&c.*

186. In ſome Places it ſeems to be braced down by a kind of natural Contraction in form of a Fold; as in that Fold which ſeparates the Baſis of the Chin from the Neck; and in that which diſtinguiſhes the Buttocks from the reſt of the Thigh. We obſerve it likewiſe to be intirely ſunk, or as it were perforated by a kind of Dimple or Foſſula, as in the Navel of fat Perſons.

187. These Depreſſions and Folds are never obliterated, let the Perſon be ever ſo fat, becauſe they are natural, and depend on the particular Conformation of the Membrana Adipoſa, the Laminæ of which are wanting at theſe Places.

188. The Fat is likewiſe of great uſe to the Muſcles in preſerving the Flexibility neceſſary for their Actions, and in preventing or leſſening their mutual Frictions. This Uſe is of the ſame kind with that of the unctuous Matter found in the Joints, which was explained in the Deſcription of the freſh Bones.

189. Lastly, the Fat, as a fine oily Subſtance in its natutal State, may be ſome defence againſt the Cold, which we find makes more Impreſſion on lean than on fat Perſons. It is for this Reaſon, that to guard themſelves againſt the exceſſive Colds of hard Winters, and to prevent Chilblains, Travellers rub the Extremities of their Bodies, and eſpecially their Feet, with ſpirituous Oils, ſuch as that of Turpentine, *&c.*

190. This Maſs of Fat, which makes an univerſal Integument of the Body, is different from that which is found in the Abdomen, Thorax, Canal of the Spina Dorſi, Articulations of the Bones, and in the Bones themſelves.

191. But the difference of all theſe particular Maſſes of Fat conſiſts chiefly, as I have ſaid, in the Thickneſs or Fineneſs of the Pellicles, in the Largeneſs or Smallneſs of the Cells, and in the Conſiſtence, Fluidity and Subtlety of the oily Matter.

### §. 5. *The Nails.*

192. The Nails are looked upon by ſome as Productions of the Cutaneous Papillæ, and by others, as a Continuation of the Epidermis. This laſt Opinion agrees with Experiments made by Maceration, by means of which the Epidermis may be ſeparated intire from the Hands and Feet, like a Glove or Sock.

193. In this Experiment we ſee the Nails part from the Papillæ, and go along with the Epidermis, to which they remain united like a kind of Appendix; and yet their Subſtance and Structure appears to be very different from that of the Epidermis.

194. Their Subſtance is like that of Horn, and they are compoſed of ſeveral Planes of longitudinal Fibres ſoddered together. Theſe Strata end at the Extremity of each Finger, and are all nearly of an equal Thickneſs, but of different Lengths.

195. The external Plane or Stratum is the longeſt, and the reſt decreaſe gradually, the innermoſt being the ſhorteſt; ſo that the Nail increaſes in thickneſs from its Union with the Epidermis where it is thinneſt, to the end of the Finger where it is thickeſt.

196. The graduated Extremities or Roots of all the Fibres of which theſe Planes conſiſt, are hollowed for the Reception of the ſame Number of very ſmall oblique Papillæ, which are Continuations of the true Skin, which having reached to the Root of the Nail, forms a Semilunar Fold in which that Root is lodged.

197. After this Semilunar Fold, the Skin is continued on the whole inner Surface of the Nail, the Papillæ inſinuating themſelves in the manner already ſaid. The Fold of the Skin is accompanied by the Epidermis, to the Root of the Nail exteriourly, to which it adheres very cloſely.

198. Three Parts are generally diſtinguiſhed in the Nail, the Root, Body and Extremity. The Root is white and in form of a Creſcent; and the greateſt part of it is hid under the Semilunar Fold already mentioned.

199. The Creſcent and the Fold lie in contrary Directions to each other. The Body of the Nail is naturally arched, tranſparent, and appears of the Colour of the Cutaneous Papillæ which lie under it. The Extremity of the Nail does not adhere to any thing, and ſtill continues to grow as often as it is cut.

200. The principal Uſe of the Nails is to ſtrengthen the Ends of the Fingers and Toes, and to hinder them from being inverted towards the convex ſide of the Hand or Foot, when we handle or preſs upon any thing hard. For in the Hand, the ſtrongeſt and moſt frequent Impreſſions are made on the ſide of the Palm, and in the Foot, on the Sole; and therefore the Nails ſerve rather for Buttreſſes than for Shields.

## §. 6. *The Hairs.*

201. The Hairs belong as much to the Integuments as the Nails. They are a kind of Reeds or Ruſhes, the Roots or Bulbs of which lie toward that ſide of the Skin which is next the Membrana Adipoſa. The Trunk or beginning of the Stem perforates the Skin, and the reſt of the Stem advances beyond the outer Surface of the Skin, to a certain diſtance, which is very various in the different Parts of the Body.

202. When the different Hairs are examined by a Microſcope, we find the Roots more or leſs Oval, the largeſt Extremity being either turned toward or fixed in the Corpus Adipoſum. The ſmalleſt Extremity is turned toward the Skin, and in ſome Places fixed in the Skin.

203. This oval Root is covered by a whitiſh ſtrong Membrane, in ſome meaſure elaſtic, and it is connected either to the Skin, to the Corpus Adipoſum,

poſum, or to both, by a great Number of very fine Veſſels and nervous Filaments.

204. Within the Root, we obſerve a kind of Glue, ſome very fine Filaments of which advance toward the ſmall Extremity, where they unite and form the Stem, which paſſes through this ſmall Extremity to the Skin. As the Stem paſſes through the Root, the outer Membrane is elongated in form of a Tube which cloſely inveſts the Stem, and is intirely united to it.

205. The Stem having reached the Surface of the Skin, pierces the Bottom of a ſmall Foſſula between the Papillæ, or ſometimes a particular Papilla, and there it meets the Epidermis, which ſeems to be inverted round it, and to unite with it entirely. A ſort of unctuous Matter tranſudes through the Sides of the Foſſula, which is beſtowed on the Stem, and accompanies it more or leſs, as it runs out from the Skin, in form of an Hair.

206. Hairs differ in Length, Thickneſs, and Solidity, in the different Parts of the Body. Thoſe on the Head, are called in *Engliſh* by the general Name of Hairs; thoſe which are diſpoſed Archwiſe above the Eyes, Supercilia, or the Eye-Brows; thoſe on the Edges of the Palpebræ, Cilia, or the Eye-Laſhes; and thoſe which ſurround the Mouth, and cover the Chin, the Beard. In other Parts of the Body, they have no particular Names; and their different Lengths, Thickneſſes, *&c.* in all theſe Parts, are ſufficiently known.

207. Their natural Figure ſeems to be rather Cylindrical, than Angular; which is chiefly accidental. Their Colour is probably the ſame with that of the Glue, or medullary Matter of the Root, the different Conſiſtence of which, makes the Hairs more or leſs hard, flexible, *&c.* Laſtly, their ſtreight or crooked Direction muſt depend on that of the Holes, through which the Stems paſs.

208. The Uſe of the Hairs, with reſpect to the Human Body in general, is not ſufficiently known to be determined with certainty. Their Uſes, with regard to ſome particular Parts may be diſcovered, as we ſhall ſee in the Deſcription of theſe Parts.

### § 7. *The ſuppoſed Integuments of the Ancients.*

209. Besides the Integuments, which I have here deſcribed, the Ancients reckon'd two others, the Panniculus Carnoſus, and Membrana Communis Muſculorum.

210. The Panniculus Carnoſus is found in Quadrupeds, but not in Men, whoſe Cutaneous Muſcles are in a very ſmall number, and moſt of them of a very ſmall Extent, except that which I call Muſculus Cutaneus in particular; but even that Muſcle cannot in any tolerable Senſe be reckoned a common Integument.

211. There is no common Membrane of the Muſcles, which covers the Body like an Integument; it being no more than particular Expanſions of

the Membranes of ſome Muſcles, or Aponeurotic Expanſions from other Muſcles.

212. The Elongations of the Lamina of the Membrana Adipoſa, or Cellularis, may likewiſe have given riſe to this Miſtake, eſpecially in ſuch Places, where this Membrane is cloſely united to the proper Membrane of the Muſcles.

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## SECT. VIII.

## *A Deſcription of the* ABDOMEN.

*Introduction.* 1. IN the compendious View of the Parts of the Human Body, I gave a general Deſcription and Diviſion of the Abdomen, with a particular Enumeration of the external and internal Parts of which it is compoſed, and which it contains or ſupports. Therefore, that I may not be obliged to repeat theſe general Things, I muſt deſire the Reader to reviſe what was there ſaid, before he begins this Section.

*External Conformation of the Abdomen.* 2. THE whole Fore-part of the Abdomen forms an oblong Convexity, like an oval Vault, more or leſs prominent in the natural State, in proportion to the quantity of Fat upon it, and of Food contained in it, or to the different Degrees of Pregnancy in Women. The Hypogaſtric and Umbilical Regions are more ſubject to theſe Varieties, than the Epigaſtric Region.

3. ON the ſides, between the Hypochondria, and Oſſa Ilium or Haunch, the Abdomen is commonly a little contracted; and backwatd, about the middle of the Regio Lumbaris, it is gently depreſſed, forming a kind of tranſverſe Cavity, anſwering to the natural Incurvation of the Lumbar Portion of the Spina Dorſi, deſcribed in Sect. I.

4. THIS anteriour Convexity, and poſteriour Cavity change, as we ſit, ſtand, kneel, lie at our full length, or with the Thighs bent; and theſe Variations depend on the particular Situation of the Oſſa Innominata, in theſe different Poſtures.

5. IN ſtanding, the Convexity of the Belly, and Cavity of the Loins, are more conſiderable, than in moſt other Situations; for then the lower Extremity of the Os Sacrum is turned very far back, and conſequently the Os Pubis very much down. In this Situation of the Pelvis, the Inteſtines fall naturally forward, and thus increaſe the Convexity of the Abdomen; and as the Vertebræ of the Loins are very much bent at the ſame time, the Cavity in that Place muſt likewiſe be very conſiderable.

6. IN kneeling, the Oſſa Pubis are ſtill lower than when we ſtand; and this not only increaſes the Hollow of the Loins, and throws the Abdomen and its Viſcera more outward or forward, but alſo in ſome meaſure ſtrains the Abdominal Muſcles; which is ſo uneaſy to ſome Perſons, as to cauſe them to faint away.

7. THIS Depreſſion of the Os Pubis in kneeling, depends partly on the Tenſion of the two Muſculi Recti Anteriores, the lower Tendons of which are in this Situation, drawn with Violence under the Condyloide Pulley of the Os Femoris.

8. WHEN we ſit in the common manner, that is, with the Thighs ſtretched out in a Plane parallel to that of the Seat, the Convexity of the Belly and Hollow of the Loins diminiſh.

9.

9. For the Pelvis being in this Situation, ſupported on the Tubercula Iſchii, and theſe Tubercles being very near the Fore-part of the Pelvis; the Trunk of the Body preſſing on the Os Sacrum, muſt lower the Pelvis behind, and raiſe it before.

10. When we lie upon the Back at full length, and with the Thighs extended, the Belly is leſs convex, but more ſtretched and hard; whereas, when the Thighs are bent, it is ſoft and lax. In this Situation, the Regio Lumbaris is almoſt flat and very little depreſſed.

11. When we lie on the Back, and raiſe the Head, or endeavour to raiſe it, we feel a Tenſion in the Fore-part of the Abdomen, which increaſes in proportion to the force we uſe in raiſing the Head.

12. These Varieties of the external Conformation of the Abdomen have a near Relation to ſo great a number of other Phænomena, in the Animal Œconomy of the Human Body, that it would require a whole Volume to explain all the Particulars thereof; neither are Details of this kind very proper in a Work deſigned to be purely Anatomical, in which, conſequently, our main Buſineſs is to give a full and accurate Deſcription of the true Structure of the Parts, and only to point out in general their principal Uſes. The reſt I reſolve to make the Subject of another Work, as I have already ſaid.

*Integuments of the Abdomen.*

13. I mentioned the Integuments of the Abdomen in general, in the compendious View of the Parts. Fewer Papillæ appear in the Skin of the Belly than any where elſe. The anteriour Portion of it is not only thinner and more compact than the poſteriour, as has been already obſerved, but it has this likewiſe peculiar to it, that it may be naturally increaſed very much in breadth, and ſometimes in a very extraordinary manner, without loſing any thing of its thickneſs, in proportion to what it gains in breadth.

14. This Peculiarity likewiſe belongs to the Epidermis. I here ſpeak only of what is obſervable in the natural State of Corpulency or Pregnancy, but I have not as yet been able to diſcover, what it is in the Texture or Structure of this Skin and Epidermis, on which this Peculiarity depends. All that I have been able to remark about it, was in the dead Body of a Woman, whoſe Belly was contracted and fallen; namely, that on the Surface of the Skin there was a great number of Lozenges diſpoſed in a reticular manner.

15. The Marks of theſe ſuperficial Lozenges were in the Epidermis. They were compoſed of ſeveral fine Lines, which altogether extended to a ſenſible breadth. The Areas or Meſhes of theſe Lozenges, which ſeem'd to be about the ſixth part of an Inch in breadth, were very flat and thin.

16. In the manner in which *Steno* uſed to open Bodies, by making two longitudinal Inciſions in the Integuments, and ſo leaving a middle Band made up of the Skin and Fat, in their true places, it is eaſy to demonſtrate the Union of the Aponeurotic or tendinous Productions with the Arteries, Veins and Nerves, in order to form the Skin of the Abdomen; and the ſame uſe might be made of this Method, in other Parts of the Skin, as I ſhall ſhow in another Place.

17. The Cells of the Membrana Adipoſa, which covers the convex Part of the Abdomen, are diſpoſed in a very regular manner, as I diſcovered by that Method of opening Bodies, which I have always made uſe of, both in my publick and private Courſes. This Method is to make two oblique Inciſions in the Integuments, from the Navel to the Groins, and to ſeparate this angular Portion of the Integuments, and throw it down over the Parts of Generation, that they may be covered, during the Demonſtration.

18. This Triangular Portion being thus inverted, there appears on the inner Surface of the Membrana Adipoſa, a longitudinal Line like a kind of Raphe, produced by the meeting of theſe cellular Rows, which form Angles ſucceſſively, one above another, oppoſite to the Linea Alba of the Abdomen. The Cells in theſe Rows are more oblong than the reſt, and in a manner oval, or like a Grain of Wheat.

*Cavity of the Abdomen.* 19. The Appendix Enſiformis of the Sternum, the Cartilaginous Portions of the laſt Pair of true Ribs; thoſe of the firſt four Pairs of falſe Ribs, all the fifth Pair, the five Lumbar Vertebræ, the Oſſa Innominata, the Os Sacrum, and Os Coccygis, form the bony Sides of the Cavity of the Abdomen.

20. The Diaphragm, the Muſcles called particularly Muſculi Abdominis, the Quadrati Lumborum, Pſoai, Iliaci, the Muſcles of the Coccyx, and of the Inteſtinum Rectum, form the chief Part of the Circumference of this Cavity, and its whole inner Surface is lined by a membranous Expanſion termed Peritonæum; all theſe Parts being covered by the Integuments already ſpoken to. As additional or auxiliary Parts, we might likewiſe add ſome Portions of the Sacro-Lumbares, Longiſſimi Dorſi, Vertebrales, Glutæi, *&c.*

21. The Cavity of the Abdomen is of an irregularly oval Figure, but ſtill ſymmetrical. On the foreſide it is uniformly arched or oval, and its greateſt Capacity is even with the Navel, and neareſt Part of the Hypogaſtrium. On the upper ſide it is bounded by a Portion of a Vault, very much inclined. On the backſide, it is in a manner divided into two Cavities by the jutting out of the Vertebræ of the Loins. On the lower ſide, it contracts gradually all the way to what I call the little Edge of the Pelvis, and from thence expands again a little, as far as the Os Coccygis, and Tubercles of the Iſchium, terminating in the void Space between theſe three Parts.

## §. 1. *Peritonæum.*

22. Having carefully removed the Muſcles of the Abdomen, the firſt thing we diſcover is a very conſiderable membranous Covering, which adheres immediately to the inner Surface of the Muſculi Tranſverſi, and of all the other Parts of this Cavity; and involves and inveſts all the Viſcera contained therein, as in a kind of Bag. This Membrane is named Peritonæum, from a *Greek* Word, which ſignifies to be ſpread around.

23. The Peritonæum in general is a Membrane of a pretty cloſe Texture, and yet very limber and capable of a very great Extenſion; after which it can recover itſelf, and be contracted to its ordinary Size; as we ſee in Pregnancy, Dropſies, Corpulency and Repletion.

24. It ſeems to be made up at leaſt of two Portions, one internal, the other external; which have been looked upon by many Anatomiſts, as a Duplicature of two diſtinct membranous Laminæ. But properly ſpeaking, the internal Portion alone deſerves the Name of a membranous Lamina, as being the main Body of the Peritonæum. The external Portion is no more than a kind of fibrous or follicular Apophyſis of the internal; and may properly enough be termed the cellular Subſtance of the Peritonæum.

25. The true membranous Lamina, commonly called the internal Lamina, is very ſmooth, and poliſhed on that ſide which is turned to the Cavity and Viſcera of the Abdomen, and continually moiſtened by a ſerous Fluid diſcharged through almoſt imperceptible Pores.

26. These Pores may be ſeen by ſpreading a Portion of the Peritonæum on the end of the Finger, and then pulling it very tight on all ſides; for then the Pores are dilated, and ſmall Drops may be obſerved to run from them, even without a Microſcope.

27. The Sources of this Fluid are not as yet ſufficiently known. Perhaps it comes out by a kind of Tranſudation or Tranſpiration, like that which we obſerve in Animals newly killed. The whitiſh Corpuſcles found in diſeaſed Subjects are no Proof of the Glands, which ſome Anatomiſts place there in the natural State.

28. The cellular Subſtance, or external Portion of the Peritonæum, adheres very cloſely to the Parts which form the inſides of the Cavity of the Abdomen, and it is not every where of an equal thickneſs. In ſome places it is in a very ſmall quantity, and ſcarcely any appears at the tendinous or aponeurotic Portions of the Muſculi Tranſverſi, and on the lower ſide of the Diaphragm.

29. In all other places, it is thicker, and forms Cells expanded into very fine Laminæ, which in diſeaſed Subjects become ſometimes ſo broad and thick, as to reſemble ſo many diſtinct Membranes.

30. In ſome places, this Subſtance is every way like a Membrana Adipoſa, being filled with Fat, as round the Kidneys, and along the fleſhy Portions of the tranſverſe Muſcles to which it adheres. It intirely ſurrounds ſome Parts, as the Bladder, Ureters, Kidneys, ſpermatic Veſſels, *&c.* and it is in theſe places improperly term'd the Duplicature of the Peritonæum.

31. Besides theſe Differences in thickneſs, the cellular Subſtance has ſeveral Elongations, which have been called Productions of the Peritonæum. Two of theſe Productions accompany and inveſt the ſpermatic Ropes in Males, and the vaſcular Ropes, commonly called the round Ligaments, in Women. There are other two, which paſs under the Ligamentum Falloppii, with the crural Veſſels, which they involve and they are gradually loſt in their Courſe downward.

32. To theſe four Productions of the cellular Subſtance of the Peritonæum, we may add a fifth, which is ſpread on the Neck of the Bladder, and perhaps a ſixth, which accompanies the Inteſtinum Rectum. All theſe Elongations paſs out of the Cavity of the Abdomen, and may be termed external, to diſtinguiſh them from others that remain in the Abdomen, and are called internal, of which hereafter.

33. The great Blood-Veſſels, that is, the Aorta and Vena Cava are likewiſe involved in this cellular Subſtance of the Peritonæum. In a word, it involves immediately and ſeparately all the Parts and Organs, which are commonly ſaid to lie in the Duplicature of the Peritonæum.

34. The true Lamina or membranous Portion of the Peritonæum, is connected by the Intervention of the cellular Subſtance, to the inner Surface of the Cavity of the Abdomen, but it does not naturally accompany the external Elongations of that Subſtance. It only covers the Origin or Baſis of theſe Productions, without any Alteration in its own Surface, at theſe Places.

35. It has nevertheleſs, Productions of its own, but they are very different from thoſe of the cellular Subſtance; for they run from without, inward, that is, they advance from the convex ſide of the great Bag of the Peritonæum, into the Cavity of that Bag, ſome more, ſome leſs, and alſo in different manners; as if the ſides of a large Ball or Bladder were thruſt inward into the Cavity of the Ball or Bladder.

36. Of theſe internal Elongations or Intropreſſions of the true Lamina of the Peritonæum, ſome are ſimply folded, like a Duplicature; ſome are expanded like inverted Bags or Sacculi to contain ſome Viſcus; ſome begin by a ſimple Duplicature, and are afterwards expanded into a Cavity which contains ſome Organ; ſome are alternately extended in the form of ſimple Duplicatures, and of Cavities; and laſtly, ſome form only a ſmall Eminence on the inner Surface of the great Cavity of the Peritonæum.

37. Under the firſt Species of theſe Productions, we may bring the membranous Ligaments of the Abdomen, ſuch as thoſe of the Liver, Colon, *&c.* We ſee the ſecond Species in the external Membrane of the Liver; the third, in the Meſentery; the fourth, in the Meſocolon; and the fifth, at the Kidneys and Ureters.

38. Besides the external Productions of the cellular Subſtance of the Peritonæum, it has the ſame number of internal Elongations with the true Lamina; which lie between all the Duplicatures, and line the inſides of all the Cavities, or that ſide next the Viſcera contained in them.

39. The Uſes of the Peritonæum in general ſeem to be very evident from the Deſcription which I have given of it; and the chief of theſe Uſes are, to line the Cavity of the Abdomen, to inveſt the Viſcera contained in that Cavity as in a common Bag, to ſupply them with particular Coats, to form Productions, Ligaments, Connexions, Folds, Vaginæ, *&c.* as we ſhall ſee hereafter.

40. The fine Fluid which tranſudes through the whole internal Surface of the Peritonæum, prevents the Inconveniencies which might ariſe from the

continual Frictions and Motions, to which the Viſcera of the Abdomen are expoſed either naturally, or by external Impulſes.

41. I muſt here obſerve, that it is the common Cuſtom to demonſtrate four Ligamentary Ropes, termed the Umbilical Veſſels, before the Peritonæum is opened, becauſe they adhere to the Umbilicus, and three of them are really Veſſels in the Fœtus, *viz.* two umbilical Arteries, and one Vein. We are in a manner obliged to ſubmit to this Cuſtom, in publick anatomical Demonſtrations, where we have but one Subject for the whole; but as I am here under no ſuch neceſſity, I refer the Deſcription of theſe Ligaments to other more proper places of this Work. The venal Ligament ſhall be deſcribed in the Hiſtory of the Liver; and the two arterial Ligaments, together with the Urachus, which is the fourth, in the Hiſtory of the Bladder.

42. It is ſufficient to obſerve here in general, that three of theſe umbilical Ropes or Ligaments are involved ſeparately, and ſuſtained by a Production or Duplicature, which the Peritonæum ſends into the Cavity of the Abdomen, in form of a Falx. In the publick Diſſections and Demonſtrations which I made at the Phyſick-Schools in 1726, I ſhow'd the manner of demonſtrating theſe Falces, and of diſtinguiſhing them from the ligamentary Ropes.

## §. 2. *Ventriculus.*

*Situation and Figure of the Stomach.*

43. The Stomach is a great Bag or Reſervoir, ſituated partly in the left Hypochondrium and partly in the Epigaſtrium.

44. The Figure of the Stomach is like that of a Bag-Pipe, that is, it is oblong, incurvated, large and capacious at one end, and ſmall and contracted at the other. We ſee this Figure moſt evidently, when the Stomach is moderately filled with Air or with any other Fluid.

45. The Curvature of the Stomach gives us occaſion to diſtinguiſh two Arches in it, one large, which runs along the greateſt Convexity, and one ſmall, directly oppoſite to the former. I name theſe Arches the great and ſmall Curvatures of the Stomach; and by the ſides of the Stomach, I underſtand the two lateral Portions which lie between the two Arches.

46. The Stomach has two Extremities, one large, and one ſmall like a crooked Funnel. It has two Openings, called the Orifices of the Stomach, one between the great Extremity and the ſmall Curvature, the other at the end of the ſmall or contracted Extremity. The firſt Opening is a Continuation of the Œſophagus; the other joins the Inteſtinal Canal, and is called by the name of Pylorus.

47. The Stomach is not ſituated in the left Hypochondrium, and Epigaſtric Region in the manner repreſented in moſt of the Figures. It lies tranſverſely, obliquely and almoſt laterally, in ſuch a manner, as that the great Extremity and the Orifice next it, are on the left hand, and the ſmall Extremity with its Orifice or the Pylorus, on the right hand, and lower and more inclined than the former. Therefore we ought with the ancient Anatomiſts to call one of theſe Orifices ſuperiour, the other inferiour.

48. The great Extremity of the Stomach is in the left Hypochondrium, and for the moſt part immediately under the Diaphragm. Yet the ſuperiour Orifice is not in the left Hypochondrium, but almoſt oppoſite to, and very near the middle of the Bodies of the loweſt Vertebræ of the Back.

49. The ſmall Extremity of the Stomach does not reach to the right Hypochondrium. It bends obliquely backward toward the upper Orifice, ſo that the Pylorus lies about two fingers breadth from the Body of the Vertebræ, immediately under the ſmall Portion of the Liver, and conſequently lower down, and more forward than the other Orifice, by almoſt the ſame diſtance. This Extremity of the Stomach has ſometimes a particular Dilatation on the ſide next the great Curvature.

50. According to this natural Situation, the Stomach, eſpecially when full, lies ſo as that the great Curvature is turned more forward than downward, and the ſmall Curvature more backward than upward.

51. One of the lateral convex Sides is turned upward, the other downward; and not forward and backward as they appear in dead Bodies, where the Inteſtines do not ſupport them in their natural Situation.

52. If we divide the Stomach along the two Curvatures into two equal Parts, we ſhall ſee that the two Orifices do not both adhere to the ſame half of this Diviſion, as we would be apt to imagine according to the common Notion; but that the Diaphragmatic Orifice is intirely in the upper half, and the Inteſtinal Orifice in the lower half.

53. Therefore the Body of the Stomach is ſo far from lying in the ſame Plane with the Œſophagus, as it is commonly repreſented in Figures drawn from a Stomach taken out of the Body and laid upon a Table; that it forms an Angle or Fold, immediately at the Paſſage of the Œſophagus through the ſmall Muſcle of the Diaphragm; and it is on account of this Angle that the ſuperiour Orifice is turned backward.

*Structure of the Stomach.*

54. The Stomach is compoſed of ſeveral Parts, the chief of which are the different Strata which form its Subſtance, to which Anatomiſts give the name of Tunicæ or Coats. Theſe Coats are commonly reckoned to be four in number, the outer or common, the fleſhy or muſcular, the nervous or aponeurotic, and the villous or inner Coat; and they are afterwards ſubdivided ſeveral ways.

55. The firſt or outermoſt Coat is ſimply membranous, being one of the internal Productions of the Peritonæum. This appears evidently at the Connexion of the ſuperiour Orifice with the Diaphragm, where the external Membrane of the Stomach is really continuous with the Membrane, which lines the inferiour Surface of the Diaphragm; and it is from this that it has been named the common Coat.

56. The ſecond or muſcular Coat is made up of ſeveral Planes of Fibres, which may all be reduced to two, one external, the other internal. The external Coat is longitudinal, tho' in different reſpects, following nearly the Direction of the Curvatures and Convexities of the Stomach; and the internal Plane is tranſverſely circular.

57. The Fibres of the external Plane run ſlanting in ſeveral places, and are interſected by ſmall oblique whitiſh Lines, which ſeem to be in ſome meaſure Tendinous. This Plane is ſtrengthened by a particular Faſciculus which runs along the ſmall Curvature, its Fibres appearing to be leſs oblique than thoſe of the great Plane.

58. The Fibres of the inner or circular Plane of this muſcular Coat are ſtronger than thoſe of the outer Plane. They are rather Segments which unite at different diſtances, than intire Circles; and they are likewiſe interſected by great numbers of ſmall white Lines, in ſome meaſure Tendinous, and very oblique, which altogether repreſent a kind of Net-work, the Areolæ or Meſhes of which are very narrow.

59. As theſe Circles or Segments advance on the great Extremity of the Stomach, they diminiſh gradually, and form a kind of muſcular Vortex, the Center of which is in the midle of that Extremity.

60. Between the outer and inner Planes, round the ſuperiour Orifice, there are two diſtinct Planes, about the breadth of a Finger, and very oblique, which ſurround this Orrifice in oppoſite Directions, and interſect each other where they meet on the two lateral Sides.

61. Along the middle of each lateral ſide of the ſmall Extremity, there runs a tendinous or ligamentary flat Portion, above a quarter of an Inch in breadth, which terminates in the Pylorus. Theſe two Portions lie between the common and muſcular Coats, and adhere very ſtrongly to the firſt.

62. Between the ſame two Coats, there is a cellular Subſtance which adheres very cloſely to the external Coat, and inſinuates itſelf between the fleſhy Fibres of the ſecond, all the way to the third, as may be perceived by blowing it up. Some make it a diſtinct Coat, and call it Tunica Celluloſa, but it is no more than the cellular Portion of the membranous Coat, like the cellular Portion of the Peritonæum.

63. The third Coat, called commonly Tunica Nervoſa, ſuſtains on its convex ſide, a very large reticular Diſtribution of Capillary Veſſels and Nerves. On the concave ſide it ſeems to be of a very looſe Texture, and as it were ſpungy or filamentary, containing a great number of ſmall Glandular Bodies, eſpecially near the ſmall Curvature and ſmall Extremity of the Stomach.

64. This ſpungy Texture reſembles fine Cotton, as may be ſeen, by macerating it a little in clear Water, which ſwells it conſiderably in a very ſhort ſpace of time. It is ſupported by a kind of Ground-work of very fine ligamentary or aponeurotic Filaments which interſect each other obliquely, much in the ſame manner as the third Coat of the Inteſtines, of which hereafter; and it adheres to the convex ſide of the villous Coat.

65. The fourth Coat of the Stomach is termed Villoſa, becauſe when it ſwims in clear Water, ſome have imagined they ſaw ſomething in it like the Pile of Velvet. The Ancients called it Tunica Fungoſa, and perhaps this name agrees beſt with its true Structure. We obſerve in it a great number of ſmall Holes anſwering to the ſmall Glands already mentioned.

66. These two Coats are of a larger extent than the two former, and they join in forming large Rugæ on the concave Surface of the Stomach,

the greateſt part of which are tranſverſe, tho' irregular and waving. There are likewiſe ſome longitudinal ones, which interſect the others, but at the Pylorus they all become longitudinal, and terminate there.

67. At the ſuperiour Orifice of the Stomach, theſe Rugæ are in a manner radiated, and ſeem to be a Continuation of the Plicæ or Folds of the Œſophagus; only they are thicker, and where theſe Rugæ and Plicæ meet, they form a ſort of Crown, which diſtinguiſhes the ſuperiour Orifice of the Stomach from the inferiour Extremity of the Œſophagus.

68. In the Interſtices of theſe Rugæ, there is often found a ſort of ſlimy Mucus, with which the whole Cavity of the Stomach ſeems likewiſe to be moiſten'd. This Mucus is much more fluid in living Bodies, and is ſupplied by the Glands of the Somach. It may be termed Succus Gaſtricus or Stomachicus.

69. On the inner Surface of the ſmall Extremity of the Stomach, at the place where it ends in the inteſtinal Canal, we obſerve a broad, thin, circular Border, with a roundiſh Hole in the middle. This Hole is the inferiour Orifice of the Stomach, called by the *Greeks* Pylorus, which ſignifies a Porter.

70. This Border is a Fold or Duplicature of the two inner Coats of the Stomach, the Nervoſa and Villoſa; and it is formed in part by a Faſciculus of fleſhy Fibres, fixed in the Duplicature of the Tunica Nervoſa, and diſtinguiſhed not only from the other fleſhy Fibres of the Extremity of the Stomach, but alſo from thoſe of the Inteſtines, by a thin, whitiſh Circle, which appears even through the external or common Coat, round the Union of the Stomach and Inteſtines.

71. The Figure of the Pylorus is that of a Ring, tranſverſely flatted, the inner Edge of which, or that next the Center, is turned obliquely toward the Inteſtines, like a broad Portion of a Funnel. This inner Edge runs naturally more or leſs into little Plaits or Gathers, like the Mouth of a Purſe almoſt ſhut; all which Particulars are very different from what Figures and dried Preparations would make us believe. It is therefore a kind of Sphincter, which can contract the inferiour Orifice of the Stomach, but ſeems not capable of ſhutting it quite cloſe.

*Arteries of the Stomach.* 72. The principal Arteries of the Stomach are the Coronaria Ventriculi, which runs along the ſmall Curvature, and the two Gaſtricæ, that is, the Siniſtra or Major, and Dextra or Minor, both which form one common Artery, which runs along the great Curvature. The Coronaria Ventriculi becomes united in the ſame manner with the Pylorina, and both make one common Veſſel.

73. These two Arterial Arches ſend a great number of Branches toward each other on both ſides of the Stomach; and theſe Branches are gradually ramified in different Directions, by very frequent Diviſions and Subdiviſions, the greateſt part of which communicate with thoſe from the other Artery.

74. From theſe frequent Ramifications and Communications of the arterial Arches of the Stomach, two different reticular Textures ariſe, whereof

one which is the largeſt, lies between the common and muſcular Coats in the cellular Subſtance found there; the other, which is very fine, lies on the Surface of the Tunica Nervoſa. This latter is a Production of the firſt, being formed by means of a great Number of very ſhort Rami, which go out from the other, and paſs through the ſmall Interſtices between the Fibres of the muſcalar Coat.

75. By artificial Injections we can ſhew a third extremely fine reticular Texture of capillary Veſſels, which run between the Glandular Bodies and Papillæ of the Tunica Villoſa. Theſe do not ſeem in the natural State to be purely Blood-Veſſels, as Inflammations and Injections may incline us to think.

76. The Arteries of the Stomach come originally from the Cæliaca, by means of the Hepatica, Splenica, and Coronaria. The Pylorica and Meſenterica ſuperior likewiſe contribute to them by Communications, more or leſs immediate. They communicate alſo with the Mammariæ Internæ and Diaphragmaticæ, and by means of the Epigaſtrica ſiniſtra, with the Meſenterica Inferior.

*Veins of the Stomach.*

77. The Veins of the Stomach are Ramifications of the Vena Portæ in general, and in particular, of the Meſaraica Major, Splenica, and Hæmorrhoidalis Interna, the Diſtribution of which, may be ſeen in the Deſcription of the Veins. They accompany the Arteries more or leſs, and form nearly the ſame kinds of Arches and reticular Textures, with this difference, that they are proportionably greater, their reticular Areolæ larger, and their external Communications more frequent.

*Nerves of the Stomach.*

78. Between the common and muſcular Coats of the Stomach, we find a greater number of Nerves of different ſizes. Many of them accompany each other, in form of a broad flat Faſciculus, along the ſmall Curvature of the Stomach, from the ſuperior to the inferior Orifice. The reſt are ſpread in different Directions, on the ſides, Extremities and great Curvature, forming at different diſtances a kind of reticular Plexus, from which a great number of Filaments are detached to the inner Coats.

79. They ariſe chiefly from the Nervi Sympathetici Medii, or eighth Pair, by means of the Plexus Coronarius Stomachicus formed round the ſuperiour Orifice of the Stomach, by the Expanſion of the Extremities of two large Ropes, which run down upon the Œſophagus, by the name of Nervi Stomachici. The great ſympathetic Nerve, commonly called Intercoſtalis, contributes likewiſe to them, by communicating Filaments, which the Plexus Stomachicus receives from the Semilunar Ganglions of the Plexus Hepaticus, and particularly from the Plexus Splenicus.

*Uſes of the Stomach.*

80. The Stomach receives in general, whatever the Mouth and Tongue ſend thither, through the Canal of the Œſophagus, but its particular uſe is to receive the Aliments, to contain them for a longer or ſhorter time, in proportion as they are more ſolid or fluid, and to digeſt them, that is, to put them in a condition to be turned into that nutritious Fluid, called Chyle.

81. This Operation, which goes by the general name of Digeſtion, and by which Chylification begins, is performed partly by the Succus Gaſtricus, which flows continually from the Tunica Villoſa, and partly by the continual Contraction and Relaxation of the Muſcular Coat. Theſe Motions in Men are but very weak, and no ways ſufficient for Digeſtion, without the aſſiſtance of the alternate Motions of the Diaphragm, and Muſcles of the Abdomen.

82. The Pylorus, or fleſhy Circle of the inferiour Orifice of the Stomach, ſerves to retain the Aliments in it, till they have acquired a ſufficient Degree of Fluidity, to paſs eaſily through that Opening. I ſay eaſily, for by a particular Irritation of the muſcular Coat of the Stomach, and ſtill more by a violent Contraction of the Diaphragm and Muſcles of the Abdomen, the Contents of the Stomach may be very ſoon forced towards the ſmall Extremity, and puſhed through the Pylorus.

83. The gentle and alternate Motions of the orbicular Fibres of the muſcular Coat, may aſſiſt in ſending through the Pylorus, in the natural way, the Aliment that is ſufficiently digeſted. This was called the Periſtaltic or Vermicular Motion, by thoſe who believed that it is ſucceſſively reiterated, like that of Earth-Worms when they creep.

84. Trituration might be a proper enough Term for this Operation, provided it be made to ſignify only a gentle Agitation or Action of the fleſhy Fibres, in a Subſtance continually moiſten'd by the Gaſtric Liquor, and not a violent grinding of a dry Subſtance.

85. The Situation of the Stomach, which is nearly tranſverſe, is likewiſe of uſe in making the Aliment remain long enough in that Cavity, and may ſerve to make the length of this Stay, in ſome meaſure, arbitrary, by means of the different Poſtures of the Body; for when we lie on the left ſide, the Aliment muſt remain longer, than when we lie on the right, *&c.*

86. The Obliquity of the Stomach may ſerve to clear up a Difficulty, that very much torments thoſe who believe, that both Orifices of the Stomach lie in the ſame Level; which is, how any heavy Subſtance once got into the Stomach, can ever riſe again to this Level, to paſs into the Inteſtines.

## §. 3. *The Inteſtines in general, and Inteſtinum Duodenum in particular.*

*Situation, Size, and Diviſion of the Inteſtines.*

87. Between the Pylorus and the very loweſt part of the Abdomen, lies a long Canal, bent in a great many different Directions, by numerous Convolutions or Turnings, called the Inteſtines.

88. This Canal thus folded and turned, forms a conſiderable Bulk, which fills the greateſt part of the Cavity of the Abdomen; and it is connected through its whole Extent, to membranous Productions or Continuations of the Peritonæum, principally to thoſe called the Meſentery and Meſocolon, of which hereafter.

89. The Incurvations of the inteſtinal Canal form two Arches, a ſmall one by which it is connected to the Meſentery and Meſocolon, and a great one on the oppoſite ſide, which lies looſe. The whole Canal is generally about ſeven or eight times as long as the Subject.

90. The inteſtinal Canal is neither of an equal Size nor Thickneſs through its whole length, from whence Anatomiſts have taken occaſion to conſider its different Portions, as ſo many particular Inteſtines, and to divide them all into ſmall and great.

91. And as they ſtill found ſome Differences in each Claſs taken all together, they divided each into three Portions, which they diſtinguiſhed by particular Names. In the ſmall Inteſtines, the three Portions are named Duodenum, Jejunum, and Ileum; and in the great Inteſtines, Cæcum, Colon and Rectum.

*Structure of the Inteſtines.*

92. The Inteſtines in general are compoſed of ſeveral Coats, much in the ſame manner with the Stomach. The firſt and outermoſt is a Continuation of the Meſentery, or of ſome other Elongation or Duplicature of the Peritonæum.

93. This is commonly termed, the common Coat, and it has a cellular Subſtance on its inner Surface, like that of the Stomach, which *M. Ruyſch* thought fit to call a diſtinct Coat, by the name of Tunica Celluloſa.

94. The ſecond Coat of the Inteſtines is fleſhy or muſcular, and made up of two planes, one external, the other internal. The external Plane is very thin, and its Fibres longitudinal; the internal Plane is thicker, and its Fibres run tranſverſely round the Circumference of the inteſtinal Cylinder.

95. I am not of opinion, that theſe Fibres are ſpiral, nor that they are perfect Circles or Rings; but they ſeem rather to be Segments of Circles, diſpoſed much in the ſame manner, as in the Stomach, and thus ſurrounding intirely the inteſtinal Canal.

96. These two Planes adhere cloſely together, and are ſeparated with great dificulty. They adhere likewiſe to the common Coat, by the Intervention of the cellular Subſtance, which is in greater quantities on the ſide next the Meſentery than the other.

97. The third Coat is called Nervoſa, and is ſomething like that of the Stomach. It has a particular Plane, which ſerves as a Baſis to ſuſtain it, made up of very fine, ſtrong, oblique Fibres, which ſeem to be of the ligamentary or tendinous kind.

98. To ſee this Plane diſtinctly, a Portion of the Inteſtines muſt be inflated; the common Coat removed, and the fleſhy Fibres ſcraped off.

99. This Coat ſuſtains two reticular Subſtances which are both vaſcular, one arterial, the other venal, accompanied by a great number of nervous Filaments. Theſe Veſſels and Nerves are Productions of the Meſenteric Veſſels and Nerves; and as they ſurround the whole Canal of the Inteſtines, ſome Anatomiſts have formed them into a diſtinct Coat, by the name of Tunica Vaſculoſa.

100. The nervous Coat ſends off from its inner Surface a great number of Portions of Septa, more or leſs circular, which contribute to the Formation of what are called Valvulæ Conniventes, of which hereafter. It likewiſe ſeems to ſuſtain ſeveral different Glandular Bodies, which we diſcover in the Cavity of the Inteſtines.

101. The fourth or innermoſt Coat is very ſoft, and is named Tunica Villoſa. It has the ſame Extent with the third Coat, which ſupports it, and it lines all the Septa of that third Coat; but it is not uniform, through the whole Canal, as we ſhall ſhow in the particular Deſcription.

*Inteſtina Tenuia.*

102. The ſmall Inteſtines form one continual uniform Canal; and tho' three Portions of it have three different Names, yet we have no ſufficient Marks whereby to diſtinguiſh them, to fix the preciſe Extent or Length of each Portion, or to ſettle its juſt Limits.

103. The firſt and ſmalleſt Portion of the whole Canal, is called Duodenum; the ſecond, which is much longer, Jejunum; and the third, which is ſtill longer than the ſecond, Ileum.

*Situation and Connexion of the Duodenum.*

104. The firſt Portion of the ſmall Inteſtine was called Duodenum, from the length aſcribed to it by the Ancients, *viz.* the breadth of twelve Fingers; and the Moderns need not cavil much about this length, if it is meaſured with the Ends of the Fingers of the Subject.

105. This Inteſtine having ariſen from the Pylorus, is immediately bent a little backward, and obliquely downward; then it bends a ſecond time toward the right Kidney, to which it is a little connected, and from thence paſſes before the Renal Artery and Vein, aſcending inſenſibly from right to left, till it gets before the Aorta and laſt Vertebræ of the Back. It continues its Courſe obliquely forward, by a gentle Turn, which may be reckon'd a third Incurvation, and alſo the Extremity of the Duodenum.

106. Through this whole Courſe, the Duodenum is firmly bound down by Folds of the Peritonæum, eſpecially by a tranſverſe Duplicature which gives Origin to the Meſocolon. The two Laminæ of this Duplicature being at firſt ſeparate, and ſoon after uniting, muſt leave a triangular Space between them, which is lined with a cellular Subſtance.

107. It is in this Space that the Duodenum adheres by means of the cellular Subſtance, to the Parts already named; and the Inteſtine is contained therein, as in a Caſe, ſo that without Diſſection, we can ſee nothing but its two Extremities, and even theſe are hid by the Colon, and by the firſt Convolutions of the Jejunum.

*Structure of the Duodenum.*

108. The firſt Coat of the Duodenum is conſequently different from that of the other ſmall Inteſtines, having this peculiar to it, that it does not inveſt the whole Circumference of the Inteſtine, becauſe through the greateſt Part of its length, it lies in the triangular Space already mentioned; and for the ſame reaſon there is a greater Quantity of cellular Subſtance belongs to the outer Coat of the Duodenum, than to that of the other Inteſtines.

109. The muſcular Coat of the Duodenum is thicker than in the Jejunum and Ileum.

110. The Tunica Nervoſa and Villoſa form conjointly on the inſides of this Inteſtine, a great number of ſmall Duplicatures which advance into the Cavity more or leſs directly, like Portions of circular Planes, with one Edge fixed to the Inteſtines, and the other, looſe. Theſe are what Anatomiſts call Valvulæ Conniventes.

111. The looſe or floating Edge of theſe Valves, is formed into ſmall Gathers or Waves in the natural State. I ſay deſignedly, in the natural State, to rectify the falſe Ideas which dry Preparations of the Inteſtines are apt to beget. The whole Surface of theſe Duplicatures or Valves, is villous as well as that of the Interſtices between them.

112. The Villi of this Inteſtine are thicker than in the Stomach; but the Texture of them in Man, is not like Hairs, as they are commonly repreſented in Figures; but rather like that of a fungous, granulated Subſtance compoſed of an infinite number of very fine Papillæ of different Figures, in which we ſee through a Microſcope, a multitude of depreſs'd Points or Pores, by which their whole Surface ſeems to be pierced.

113. By the ſame Help, we obſerve on different places of the inner Surface of this Inteſtine, ſeveral round villous Tubercles, riſing like ſmall Verrucæ at different diſtances from each other.

114. This Subſtance ſuſtains an infinite number of capillary Veſſels, of different kinds; for beſides the Blood-Veſſels, we ſometimes obſerve a great number of white Filaments which run through it, and end at its inner Surface, like ſo many capillary Roots of the Veſſels, called Venæ Lacteæ.

115. The fungous Subſtance which binds theſe capillary Filaments together, and ſurrounds them, is very tender, and the capillary Extremities of the ſmall Blood-Veſſels diſtributed through it, ſeem to be turned toward the Pores of the Papillæ. Through theſe Pores, a mucous Fluid more or leſs tranſparent, is diſcharged, which continually moiſtens the Cavity of the Inteſtine.

*Glands of the Duodenum.*

116. The internal Surface of the Duodenum is furniſhed with a great number of ſmall flat glandular Tubercles, raiſed on the ſides, and depreſſed in the middle by a kind of Foſſula; and they are more numerous, near the beginning of this Inteſtine than any where elſe. About the Pylorus, they lie in a manner in Heaps or Cluſters, and from thence the diſtance between them increaſes gradually all the way to the other Extremity, where they are ſingle.

117. These Glands, when examined carefully, appear like little Bladders, with the Orifices turned toward the Cavity of the Inteſtine, and the Bodies fixed in the ſpungy Subſtance next the nervous Coat. They furniſh a particular Fluid, which is often found to be viſcid.

*The Biliary Orifice of the Duodenum.*

118. In the inner Surface of the Duodenum, almoſt at the lower part of the firſt Incurvation, and on the ſhorteſt ſide, there is a longitudinal Eminence, in the Point or Apex of which, lies a particular Opening, which is the Orifice of the Ductus Bilarius, within which the Ductus Pancreaticus likewiſe opens.

119. This Inteſtine is commonly the wideſt, tho' the ſhorteſt of the Inteſtina Tenuia, and is inveſted by more cellular Subſtance, eſpecially while within its triangular Caſe, where it wants the outer Coat, which the others have; and conſequently it is more eaſily dilatable, by the Subſtances which might otherwiſe ſtick within it.

## §. 4. *Inteſtinum Jejunum.*

*Situation and Size of the Jejunum.*

120. The Jejunum, ſo called, becauſe it is oftener found empty than the Ileum, begins at the laſt Incurvation of the Duodenum, and is there connected to the beginning of the Meſocolon.

121. From thence it bends downward from left to right, and obliquely forward, or from the Vertebræ, and makes ſeveral Convolutions, which lie chiefly in the upper part of the umbilical Region. Through all this Courſe, it is connected to the Meſentery in the manner that ſhall be explained hereafter.

122. It is a pretty difficult matter to fix the exact Bounds between this Inteſtine and the Ileum. The external Marks of a redder Colour in the one than in the other, tho' pretty common, are not conſtant; and the internal Marks fixed from the Plurality of Valvulæ Conniventes are indeterminate, and oftentimes appear only from Diſſection.

123. These two Inteſtines may be better diſtinguiſhed by their different Situations, which are pretty regular; but as even this Mark is not particular enough, the moſt eaſy way that I have been able to contrive, and which will in moſt Caſes be found ſufficiently exact, is to divide both Inteſtines into five Parts; and to allow nearly two fifths to the Jejunum, and three fifths and a little more to the Ileum.

*Structure of the Jejunum.*

124. The Coats of the Jejunum are nearly of the ſame Structure with thoſe of the Duodenum, but thinner. The common Coat is a Continuation of the Meſentery; and the cellular Subſtance is in leſs quantity than in the Duodenum; and indeed ſeems to be altogether wanting along the great Curvature of the Convolutions, where the longitudinal Fibres of the muſcular Coat adhere very cloſely to the external Membrane.

125. This muſcular Coat is not ſo ſtrong as that of the Duodenum. The longitudinal Plane of Fibres is very thin, and almoſt imperceptible, except along the great Curvature, oppoſite to the Connexion of the Meſentery, where we ſee through the membranous Coat, a kind of whitiſh ligamentary Band, about the third part of an Inch in breadth, which is continued along the great Curvature of all the Convolutions of this Inteſtine, and of the Ileum.

126. This ligamentary Band is like thoſe which we obſerve on the ſides of the ſmall Extremity of the Stomach. It adheres perfectly to the membranous Coat and to the longitudinal Fibres of the muſcular Coat, which are here more viſible, and appear to be ſtronger than in any other place.

127. The Tunica Nervoſa, which I chooſe rather to call Reticularis, and its proper cellular or lanuginous Subſtance, have nothing peculiar to them more than has been already ſaid about the Inteſtines in general. By blowing artfully into this Subſtance, it may be made to ſwell ſo much, round the whole Cavity of the Inteſtine, as to deſtroy all the Duplicatures or Valvulæ Conniventes.

128. These Valves in this Inteſtine are very broad, very numerous, and very near each other. On the ſide of the great Curvature, their Circumference is continuous and uniform; but next the ſmall Curvature, there are ſeveral Breaks in them, the Extremities of ſome, advancing beyond the reſt, and terminating in Points. Some of theſe Valves go quite round, others only ſome part of the way, and ſome of them are very ſmall, which go obliquely between two large ones, forming a kind of Communication.

129. The Papillæ of the Tunica Villoſa are here more rais'd, more looſe and floating than in the Duodenum, and each of them ſeems to be divided into ſeveral others, by Inciſures of a very ſingular kind. In other reſpects they agree pretty much with what was ſaid in the Deſcription of the Inteſtines in general. The Obſervations and Figures publiſhed by *M. Helvetius*, firſt Phyſician to the *French* Queen, in the Memoirs of the Royal Academy, expreſs theſe Papillæ, and the whole Tunica Reticularis very juſtly.

130. The Glandular Lacunæ of the Jejunum are of the ſame Structure with the Glandulæ Brunneri or Duodenales; but they are diſpoſed in a different manner. They are partly ſingle at different diſtances from each other, and partly in ſeveral Cluſters, like flat oblong Bunches of Grapes, called Plexus Glanduloſi Peyeri. Theſe are in the largeſt quantity near the great Curvature, and they croſs through ſeveral Valvulæ Conniventes at once.

131. The Veſſels, Nerves, Connexions, *&c.* muſt be referred till the Meſentery has been deſcribed.

### §. 5. *Inteſtinum Ileum.*

132. The Convolutions of the Inteſtinum Ileum ſurround thoſe of the Jejunum on the two lateral and lower Sides, and it paſſes in a winding Courſe from the left Side, by the Hypogaſtrium, to the right Side, where it terminates a little below the right Kidney, joining the Inteſtina Craſſa, in the manner that I ſhall relate hereafter. The lateral Convolutions are ſupported by the Oſſa Ilium, ſo called, not from this Inteſtine, but from the Region of the Abdomen, termed Ilia. *Situation of the Ileum.*

133. The Structure of the Ileum is much the ſame with that of the Jejunum; only the internal Duplicatures or Valvulæ Conniventes decreaſe gradually, both in number and ſize. Near the Extremity of the Ileum their Direction is changed, and inſtead of being tranſverſe or circular, they become longitudinal, and terminate in a kind of Pylorus which advances into the Cavity of the great Inteſtines, as we ſhall ſee preſently. *Structure of the Ileum.*

134. We obſerve likewiſe in this Inteſtine, as in the Jejunum, ſingle or ſolitary Glands or Lacunæ, and alſo reticular Glands, or Glands in Cluſters, the laſt of which at the extremity of this Inteſtine, is oftentimes of a great extent; but the greateſt part of theſe Glands appear to be flatter here than in the Jejunum. The cellular Subſtance of the external Coat is in leſs quantities than in the foregoing Inteſtines, and the Ileum appears commonly more pale, or not ſo red as the Jejunum.

135. The Veſſels, Nerves, Connexions, *&c.* muſt be referred to the Hiſtory of the Meſentery.

### §. 6. *The Inteſtina Craſſa in general, and Inteſtinum Cæcum in particular.*

136. The great Inteſtines are one continued Canal, divided into three Portions, like the ſmall ones. This Canal begins by a kind of Sacculus or Bag, which is reckon'd the firſt of the three Portions, and called Cæcum. The ſecond Portion, called Colon, is the longeſt of the three, and is diſtinguiſhed from them by a great number of particular Eminences or Convexities, which appear on its outer Surface through its whole length. The laſt Portion is named Rectum, being more uniform, narrower, thicker, and much ſhorter than the Colon.

137. The Structure of the great Inteſtines is nearly the ſame with that of the ſmall ones, in regard, both to the Number and Diſpoſition of their Coats. They are ſhorter, and have fewer Convolutions, but are much more capacious. The Coats in general are ſtronger, but eſpecially the muſcular Coat. The Villi and mucilaginous Glands are different, and there are ſeveral other things relating to them, which will come in better in their particular Hiſtory.

*Situation and Structure of the Cæcum.*

138. The Inteſtinum Cæcum is only a round ſhort broad Bag, the Bottom of which is turned downward, and the Mouth or Opening upward. It lies under the right Kidney, and is hid by the laſt Convolution of the Ileum. It is about three Fingers breadth in length, and its Diameter is more than double that of the ſmall Inteſtines.

*Appendicula Vermiformis.*

139. On one ſide of the Bottom of the Cæcum lies an Appendix, reſembling a ſmall Inteſtine, nearly of the ſame length with the Cæcum, but very ſlender. It is termed Appendicula Vermiformis, from its ſuppoſed reſemblance to an Earth-worm. Its common Diameter is not above a quarter of an Inch. By one Extremity, it opens laterally, and a little obliquely into the Bottom of the Cæcum ; and the other Extremity is cloſed, being ſometimes greater, ſometimes ſmaller than the reſt of the Appendix.

140. It has ſome Contortions, like thoſe of a Worm when it is touched, from whence comes the Epithet of Vermicularis or Vermiformis ; and it may likewiſe be compared to the Gills or Pendants of a Turky-Cock. Its Structure reſembles nearly that of the other Inteſtines.

141. The internal Coat of this Appendix is folliculous, like that of the Duodenum ; and it is likewiſe Reticular, the Maſhes being the Glandular Lacunæ, which continually diſcharge a Fluid into its Cavity.

142. It has been often diſputed whether this Appendix or the large Portion, which is, as it were, the Head of the Colon, ought to be called the Cæcum ; but the general Diviſion of the Inteſtines into great and ſmall, leave no room to doubt of its being only an Appendix in Man ; whatever reaſon there may be for talking differently with reſpect to Brutes and Birds.

143. Through the membranous or common Coat of the Cæcum, we ſee three white ligamentary Bands, which adhere very cloſely, both to the outer

and muſcular Coat. One of them is hid by the adheſion of the Meſocolon; and all the three divide the Cæcum longitudinally into three parts more or leſs equal.

144. They all unite on the Appendicula Vermiformis, and cover its whole outer ſide immediately under the common Coat. Tho' they appear exteriourly on the Cæcum to be ligamentary, they are made up interiourly of fleſhy Fibres which accompany and ſtrengthen the longitudinal Fibres of the muſcular Coat.

145. The villous Subſtance of the inner Coat of the Cæcum is very ſhort, and furniſhed in ſeveral places with Glandular Lucunæ or ſolitary Glands, broader than thoſe of the ſmall Inteſtines.

146. These Glandular Lacunæ or Folliculi are flattened and depreſſed in the middle like Small-Pox. When we blow through a Pipe into theſe Lacunæ without touching them, the Folliculi are inflated, and repreſent little Caps with a Hole in the middle of their convex ſide.

## §. 7. *Inteſtinum Colon.*

*Situation and Structure of the Colon.*

147. The Colon is the moſt conſiderable of all the Inteſtines. From the Cæcum, of which it is a Continuation, it reaches it in form of an Arch, above the umbilical Region, and to the lower part of the left Hypochondrium. Its Continuity is however a little interrupted by the Ileum, which advances into the Cavity of the Colon, and together with a certain Fold of that Inteſtine, forms what is called Valvula Coli.

148. The whole convex ſide of the Colon is divided longitudinally into three Parts, by three ligamentary Bands, continued from thoſe of the Cæcum, and of the ſame Structure with theſe. Two of each Bands run on each ſide, along the great Curvature of the Colon; and the third along the ſmall Curvature.

149. The uppermoſt Band of the two that belong to the great Curvature, is the broadeſt of the three; that which belongs to the ſmall Curvature is the narroweſt, and lay hid by the Connexion of the Meſocolon, till it was brought to light by *M. Morgagni*.

150. These three longitudinal Bands do the Office of longitudinal Fræna, between which this Inteſtine is through its whole length alternately depreſſed into tranſverſe Folds, and raiſed into conſiderable Eminences. All the Folds are Duplicatures, which form Portions of Valvulæ Conniventes in the Cavity of the Inteſtine; and the Eminences form Receptacles, called the Cells of the Colon.

151. All the Coats of the Colon concur equally to the Formation of theſe Duplicatures and Cells, the Depth of which decreaſes gradually toward the Extremity of the Inteſtine; and neither of them go any further than the ligamentary Bands.

152. These Portions of the Colon which are immediately covered by the ligamentary Bands, are ſmooth and without Rugæ, and therefore if theſe

Bands alone are cut a-croſs, the Inteſtine is not elongated ſufficiently to deſtroy all the Folds and Cells.

153. The common Coat on one ſide is a Continuation of the Meſocolon, and on the other ſide it contributes by the ſame Continuation, to form the Omentum. The longitudinal Fibres of the muſcular Coat are very ſlender; and thoſe which anſwer to the annular or circular Fibres of the ſmall Inteſtines, are only Segments ſtretched over the Eminences and Folds. The other Coats are nearly as in the Cæcum; only the Glandular Lacunæ or ſolitary Glands are broader and more numerous.

154. The Arch of the Colon begins under the right Kidney, near the Hanch. It runs up on the foreſide of that Kidney to which it is connected, paſſes under the Veſicula Fellis, which tinges it with a yellow Colour at that place, and continues its Courſe before the firſt Incurvation of the Duodenum, to which it adheres, and partly hides it. In this part of its Courſe, therefore, there is a remarkable Connexion between the Colon, Duodenum, right Kidney, and Veſicula Fellis.

155. From thence the Arch of the Colon runs before the great Convexity of the Stomach, and ſometimes a little lower, then turns backward under the Spleen, in the left Hypochondrium, runs down on the foreſide of the left Kidney to which it is connected; below this Kidney turns toward the Vertebræ, and terminates there by a double Incurvation, or by two oppoſite Convolutions, which repreſent in ſome meaſure an inverted Roman S.

156. These laſt Convolutions of the Colon are ſometimes multiplied, and even advance to the right ſide of the Pelvis; and along the great Arch, and the two laſt Incurvations, there are a kind of Fringes, called Appendices Coli Adipoſæ, which I ſhall afterwards explain, as alſo the Connexions of the Colon with the Meſocolon and Omentum.

*Valvula Coli.* 157. At the Place where the Cæcum joins the Colon, one Portion of the Circumference of both is depreſſed, and forms a large Fold on the inſide, which advances into the Cavity of the Inteſtine. It is a little open in the middle, and its Extremities are very thick, by reaſon of the mutual Duplicature of the Coats of the Cæcum and Colon.

158. The Extremity of the Ileum is as it were grafted in the Opening of this Fold, and ſtrongly united to its Sides by the adheſion of its tranſverſe Fibres, to the tranſverſe Fibres of the Cæcum and Colon.

159. This Union forms a pretty thick Ring, which likewiſe advances into the common Cavity of the Cæcum and Colon, where it is wrinkled or form'd into gathers, almoſt like the lower Extremity of the Œſophagus, the Pylorus or inſide of the Anus. Its Circumference is more or leſs Oval, and by a kind of Continuity with the common Fold of the Cæcum and Colon, it forms two Productions, which *M. Morgagni* calls the Fræna of the Valvula Coli.

160. The membranous Coat of the Extremity of the Ileum is continued on the Cæcum and Colon, without ſinking into any Fold, at the place where the Ileum enters into the Colon. The longitudinal Fibres of the muſ-

cular Coat ſeem here to be confounded with the neareſt circular Fibres of the Cæcum and Colon.

161. The inner Portion of the muſcular Coat of the Ileum, runs in between the circular Fibres of the Ileum and Colon, as into a common Fold of theſe two Inteſtines, from all which a pretty thick ſhort Portion of a fleſhy Tube is formed, which is the circular riſing already mentioned.

162. The Tunica Nervoſa and Villoſa of the Extremity of the Ileum likewiſe enter the common Cavity of the Cæcum and Colon, and on the Edge of the circular Riſing, join the like Coats of theſe two Inteſtines, ſo that the circular Riſing or ſhort muſcular Tube is covered both on the outer and inner ſides by a nervous and villous Coat; that on the inſide being ſupplied by the Ileum, and the other by the two great Inteſtines.

163. The beſt Method to demonſtrate the Structure and Compoſition of this Valve, is in clear Water, and by a particular Section, while the Inteſtine is freſh, and has not been altered by any Diſeaſe, in the manner that I demonſtrated publickly in the Phyſick-Schools in 1726. In another Work, I ſhall explain particularly, the way of managing this and other ſuch Diſſections; the greateſt part of which Method, I have already communicated, both in my public and private Courſes.

164. The Situation of this Extremity of the Ileum is moſt commonly tranſverſe, and is inſerted almoſt in the ſame Direction in the common Cavity of the two Inteſtines, already mentioned, but it is often a little more inclined toward the Cæcum, than to the Colon; and whereas in all other places, the Ileum is wide and eaſily dilatable, it is very narrow at its Inſertion, and its ſides more ſolid, and firm.

165. It is chiefly in this Structure that the Mechaniſm of the Inſertion of the Ileum, in the Cæcum and Colon conſiſts; about which Inſertion or Opening, Authors are very much divided, ſome reckoning it a Valve, others, only a Sphincter.

166. It is very evident from what I have ſaid, that it is a double Machine contrived to hinder the return of the Excrements into the Ileum, becauſe it can produce this Effect partly as a Valve, and partly as a kind of Sphincter. The dried Preparations of this Part give a very falſe Idea of its Structure and Conformation; and the ſame thing is to be ſaid of the opening of the Appendicula Vermiformis into the Cæcum.

167. The capacious Arch of the Colon is connected by both Extremities to the Regio Lumbaris, near the Kidneys, by two particular Ligaments, one on the right ſide, the other on the left, which are only ſmall Duplicatures of the Peritonæum, more or leſs tranſverſe.

168. The remaining Portion, which forms the two Convolutions in form of the *Roman* S, contracts below the left Kidney, being narrower there, than lower down. The Coats of this Portion become gradually thicker and ſtronger, and likewiſe the ligamentary Bands, which approach each other by degrees, and ſeem to increaſe in breadth.

169. The Veſſels, Nerves, &c. will be found in the Deſcription of the Meſentery.

### §. 8. *Inteſtinum Rectum Anus.*

*Situation, Figure, and Size of the Rectum.*

170. The laſt of all the Inteſtines, is named Rectum, or the ſtreight Gut, from its Situation; for when view'd directly forward, it appears to run down in a ſtreight Courſe from the laſt Vertebra of the Loins, on the foreſide of the Os Sacrum, all the way to the Os Coccygis, where it tends in what is called the Anus.

171. This Inteſtine, properly ſpeaking, is a true Continuation of the laſt Convolution of the Colon, and it is the Repoſitory, Sink and Common Sewer of the whole inteſtinal Canal. It has likewiſe a ſpecial Relation to the Bladder, and to the Parts of Generation in both Sexes.

172. The Rectum having paſs'd below the laſt Vertebra of the Loins, to the inſide of the Os Sacrum, is bent backward on that concave ſide, to which it is connected, in the manner that ſhall be afterwards explained; and having reached the Os Coccygis, it runs likewiſe in the Direction of that Bone, and bends a little forward, terminating beyond the Extremity of the Coccyx.

173. The Figure of this Inteſtine varies according as it is full or empty. When empty, it is irregularly cylindrical, and ſinks in by a kind of tranſverſe Folds, and in that State, it is about three fingers breadth in Diameter, more or leſs. When full, it is wider in proportion to the quantity of Feces, Wind, or whatever elſe is contain'd in it; and it may be extended to the Size of a large Bladder, ſo as to repreſent a kind of Stomach.

*Structure of the Rectum.*

174. The membranous Coat often contains a great quantity of Fat, ſpread between it and the muſcular Coat, and forming round the Inteſtine numerous Eminences, in the room of the Appendices Adipoſæ of the Colon, which ſhall be explained in the Hiſtory of the Omentum.

175. The muſcular or fleſhy Coat is very thick: the longitudinal Fibres, which in the other Inteſtines are very thin, are in this ſtronger than the circular Fibres of the reſt. The ligamentary Bands continue to increaſe in breadth, and to approach each other, as has been ſaid, and it is to the fleſhy Fibres of theſe Bands, that the Thickneſs of the longitudinal Fibres ſeems to be owing.

176. The nervous or filamentous and internal Coats, are larger here, than in the other Inteſtines; and when the Rectum is empty, they form a great number of waving Rugæ in its Cavity, which diſappear, in proportion as that Cavity is fill'd.

177. The innermoaſt Coat is very improperly termed Villoſa, and ſcarce deſerves the name of Papillaris, becauſe of the Smallneſs of the little Corpuſcles ſpread on its Surface. It contains a great number of ſingle or ſolitary Glands; and it is always moiſten'd by a Mucus of different Conſiſtences, diſcharged by theſe Glands or Folliculi, and perhaps by the Corpuſcles alſo.

178. Near the Extremity of this Inteſtine, the Rugæ or Folds become in a manner longitudinal, and at laſt, towards the Circumference of the inner Margin of the Anus, they form little Bags or Semilunar Lacunæ, the Openings

of which are turned upward, toward the Cavity of the Inteſtine. Theſe Lacunæ are ſomething like thoſe at the lower Extremity of the Œſophagus, or upper Orifice of the Stomach.

*Muſcles of the Anus.*

179. At length the Extremity of the Rectum contracts and terminates by a narrow Orifice called the Anus, the ſides of which are diſpoſed in cloſe Folds or Gathers. This Extremity of the Inteſtine has ſeveral Muſcles belonging to it, ſome of which ſurround it like Sphincters, the reſt are broad fleſhy Planes inſerted in it, and which being likewiſe fixed to other Parts, ſuſtain it in its natural Situation, and reſtore it to that Situation, when diſturbed by the force neceſſary for the Excluſion of the Feces. Theſe latter Muſcles are termed Levatores Ani, the firſt go by the general name of Sphincters.

180. These Sphincters are three in number, one inteſtinal or orbicular, and two cutaneous or oval; whereof one is large, ſuperiour, and internal; the other ſmall, inferiour and external.

181. The inteſtinal or orbicular Sphincter of the Anus, conſiſts meerly in an Augmentation of the inferior Portion of the fleſhy Fibres of the Extremity of the Rectum.

182. In the Deſcription of the freſh Bones, I omitted two Ligaments, one call'd Ligamentum Cutaneum Oſſis Coccygis, the other Ligamentum Pubis Interoſſeum. This laſt I demonſtrated in my publick Diſſections in the Year 1726, and the other about four Years before. Theſe two Ligaments muſt be here deſcribed, before I proceed to the Cutaneous Spincters.

183. The Cutaneous Ligament goes out anteriourly, from the Extremity of the Os Coccygis. It is very ſlender, and divides unto two Portions at the Orifice of the Anus, which run into the Membrana Adipoſa, and are inſerted in the Skin on each ſide of the Anus, by a kind of Expanſion, and continuing to divaricate, they are loſt on the two ſides of the Perinæum.

184. The interoſſeous Ligament of the Oſſa Pubis is a very ſtrong triangular Membrane, fixed by two of its Edges in the inferior Rami of theſe Bones, all the way up to their common Symphyſis. The third Edge, which is the loweſt, is looſe; and this whole Membrane, the middle of which is perforated by a particular Hole, is ſtretched very tight between the two Bones, and under their Cartilaginous Arch, to which it adheres very cloſely.

185. At the lower part of this interoſſeous Ligament, along its whole lower or looſe Edge, lies a Digaſtric Muſcle, fixed by its two Extremities in the Rami of the Oſſa Pubis, its middle Tendon lying on the middle of the Edge of the Ligament. The Diſcription of that Muſcle does not belong to this place; and I mention it here, only becauſe of the Relation it bears to the Cutaneous Spincters of the Anus. It is called by ſome, Muſculus tranſverſalis Urethræ; by others, Muſculus Triangularis.

186. The Cutaneous Sphincters have each an anteriour and poſteriour Inſertion, ending both ways in a kind of Point, and comprehending the Orifice of the Anus, between their middle Portions.

187. They are diſtinguiſhed from each other by their Situation, by their Size, and by a kind of white cellular Line. The greateſt of the two appears

to be double, and the ſmalleſt lies neareſt the Skin, and adheres moſt cloſely to it.

188. They are inſerted backward, partly in the Apex of the Os Coccygis; and partly in the contiguous Portion of the Cutaneous Ligament of that Bone. Forward their chief Inſertion is in the middle Tendon of the Tranſverſalis Urethræ; and they have likewiſe ſome Connexions to other Muſcles of the Urethra, of which hereafter.

189. The Levatores Ani are broad, thin, muſcular Portions, fixed by one Extremity of their fleſhy Fibres round the concave ſide of the inferiour Portion of the Pelvis, from the Symphyſis of the Oſſa Pubis, beyond the Spine of the Iſchium. The other Extremity of theſe Fibres runs down on each ſide behind, and under the Curvature of the end of the Rectum, where they meet together, and unite from the Baſis of the Os Coccygis all the way to the Margin of the Anus.

190. By their ſuperiour Inſertions, theſe Portions are on each ſide of the Pelvis divided into three Claſſes, an anteriour, middle and poſteriour Claſs. The two anteriour Claſſes reach from about the middle of the Symphyſis of the Oſſa Pubis, to the upper Border of the Foramina Ovalia of the Pelvis. The middle Claſſes continue the ſame Courſe immediately above the Inſertion of the Obturator internus, on the Oſſa Iſchium, and a little on the Oſſa Ilium. The poſteriour Claſſes are ſpread on the inner ſides of the Oſſa Iſchium to the ſpinal Apophyſes of theſe Bones, and even a little beyond theſe, on the Ligamenta Sacro-Sciatica.

191. The anteriour Portions are in their paſſage connected to the proſtate Glands, to the Neck of the Bladder, to the Bulb of the Urethra, as ſhall be ſhown in the Deſcription of theſe Parts; and they ſometimes ſend Fibres to the Muſculus tranſverſalis Urethræ above mentioned.

192. The Fibres of all theſe Portions having by their ſuperiour Inſertions formed this large and ample Circumference, run down obliquely from before backward, contracting in breadth, and approaching each other in the manner of truncated Radii; and behind, and under the Extremity of the Rectum, they form a Digaſtric Muſcle, ſomething like the Mylo-Hyoidæus: which terminates the bony Pelvis below; and forms the bottom of the Cavity of the Abdomen, as the Diaphragm forms the upper Part.

193. It is here neceſſary to obſerve, that the Muſcles of the Os Coccygis, deſcribed §. 3. may be look'd upon as Aſſiſtants to the Levatores.

194. We ought likewiſe to remark, that the Margin or Edge of the Anus is form'd by the Union of the Skin and Epidermis, with the internal Coat of the Rectum; ſo that the moſt ſuperficial Portion of that Coat ſeems to be a Continuation of the Epidermis.

195. I refer the Arteries, Veins, Nerves, Connexions, Uſes, &c. to the place already mention'd in the Deſcription of the other Inteſtines.

## §. 9. *Meſenterium & Meſocolon.*

*Diviſion of the Meſentery, &c.*

196. This great Bundle of Inteſtines is not left to move at random in the Cavity of the Abdomen; but artfully bound down, by a membranous Web, which prevents the inteſtinal Convolutions from being intangled in each other, and from being twiſted or compreſſed in all their different ways of meeting; and yet allows them a gentle floating, but limited Motion.

197. This Web goes ſtill by the ancient *Greek* Name of Meſentery, as being in ſome meaſure in the middle of the Inteſtines. It is diſtinguiſhed into two Portions, one of which being very broad and very much plaited, connects the ſmall Inteſtines; the other, which is long and incurvated, does the ſame Office to the great Inteſtines.

198. These two Portions are in reality only one and the ſame Continuation of the membranous Lamina of the Peritonæum doubled back upon it ſelf, and they are diſtinguiſhed only by their breadth. Taken both together, they form a kind of ſpiral Roll, more or leſs plaited in its Circumference. The firſt Portion has retained the name of Meſentery, the other is termed Meſocolon.

*Structure of the Meſentery, &c.*

199. The Meſentery begins at the laſt Incurvation of the Duodenum, and runs obliquely from left to right, along the Vertebræ of the Loins. In this ſpace, the membranous Portion of the Peritonæum is detached on both hands, produces a Duplicature by two Elongations or particular Laminæ applied to each other, and thus forms the Meſentery.

200. It is narrow at its upper and lower Parts, but chiefly at the upper. The middle Portion is very broad, and the Edge of it next the Inteſtines is every where very much plaited. Theſe Plaits or Folds are only waving Inflections, ſuch as may be obſerved in the Edge of a Piece of Shamoy, which has been often drawn through the Fingers. They make this Edge of the Meſentery very long, and they run through about one third of its Breadth.

201. The two Laminæ are joined together by a cellular Subſtance, which contains Glands, Veſſels and Nerves, that ſhall be deſcribed hereafter; and in ſome Subjects it has a great quantity of Fat, which keeps the two Laminæ at a good diſtance from each other.

202. Along the whole Circumference of the Meſentery, the two Laminæ are naturally ſeparated, and applied to the two ſides of the ſmall Inteſtines which they inveſt by their Union or rather reciprocal Continuation on the great Curvature of that Canal, and carry it as in a Scarf or Sling. This is what forms the external or membranous Coat of the Inteſtines.

203. The Meſocolon is the Continuation of the Meſentery, which having reached the Extremity of the Ileum, contracts and changes its name. At this place the particular Lamina which is turned to the right ſide, forms a ſmall tranſverſe Fold, called Ligamentum Coli Dextrum.

204. Afterwards the Meſocolon aſcends toward the right Kidney, where it ſeems to be loſt by the immediate Adheſion of the Colon to that Kidney, and to the firſt Incurvation of the Duodenum. Then it appears

again, and increaſing in breadth, it continues its courſe almoſt tranſverſely under the Liver, Stomach and Spleen, where it begins to turn downward, under the left Hypochondrium toward the Kidney on the ſame ſide.

205. THROUGH this whole Courſe, the Meſocolon extends in breadth, and forms nearly a tranſverſe ſemicircular Plane, very little plaited at its great Circumference. By this Circumference or Edge, it is connected to the Colon; and hides that ligamentary Band of this Inteſtine, which runs along its ſmall Curvature. By its ſhort or ſmall Edge, it forms the triangular Caſe of the Duodenum, and by its great Edge, the external Coat of the Colon, in the ſame manner as the Meſentery does that of the ſmall Inteſtines. As it paſſes under the large Extremity of the Stomach, it adheres a little to the lower Portion of that Extremity, as the Diaphragm does to the upper.

206. HAVING got below the left Kidney, it contracts and forms another tranſverſe Fold, called Ligamentum Coli Siniſtrum. Afterwards it expands again, but not ſo much as in the upper Part, and runs down on the left Pſoas Muſcle, towards the laſt Vertebræ of the Loins. This deſcending Portion is fixed to the Convolutions of the Colon in the ſame manner as the ſuperiour Portion is to the Arch of that Inteſtine.

207. THE Inteſtinum Rectum is likewiſe inveſted by a particular Production of the Peritonæum, called commonly by the barbarous Name of Meſo-Rectum. This Production is very narrow, and about the middle of the foreſide of the Rectum, it forms a tranſverſe ſemicircular Fold, which appears when the Inteſtine is empty; but is loſt, when it is filled.

## §. 10. *Glandulæ Meſentericæ, Vaſa Lymphatica & Lactea.*

*Glands of the Meſentery.*

208. BETWEEN the Laminæ of the Meſentery, a great number of Glands lies ſcattered through the cellular Subſtance. In the natural State, theſe Glands are ſomething of the figure of Lentils or little round Beans; ſome of them being orbicular, others oval, but all of them a little flatted, and in corpulent Subjects we find them ſurrounded with Fat.

209. THESE Glands are of the number of thoſe that Anatomiſts call Glandulæ Conglobatæ, the Structure of which is not as yet ſufficiently known. They ſeem to be of a cellular Subſtance, ſurrounded by a very fine Membrane or Coat, on which by the help of Microſcopes, we diſcover an Intertexture of particular Filaments, which *Malpighi* believed to be fleſhy Fibres.

210. THE niceſt anatomical Injections have not hitherto given us any Satisfaction about theſe Particulars; for tho' they be made with all poſſible Care, they always fill the folliculous Texture of theſe Glands. And tho' by means of theſe Injections, we may diſcover a great many Veſſels, which were before inviſible, we are not a whit the nearer our Purpoſe, becauſe we cannot by this Method diſtinguiſh the Secretory, Excretory, and Blood-Veſſels from each other.

*Lymphatic Veſſels.*

211. BESIDES the Blood-Veſſels, which are diſtributed in a reticular manner in the Meſenteric Glands, and beſides many nervous Filaments ſpread

through them; we diſcover an infinite number of ſmall Veſſels of another kind, running from Gland to Gland.

212. These Veſſels are extremely thin and tranſparent, and furniſhed on the inſide with numerous Valves, which appear on the outſide like little ſmall Knots very near each other. They go out from each Gland by Ramifications, as by ſo many Roots, and having formed a ſmall Trunk, they are again divided, and enter ſome neighbouring Gland by the ſame kind of Ramifications by which they went out from the former.

*Lacteal Veſſels.*

213. They are termed Lymphatic Veſſels, becauſe for the moſt part, they contain a very clear, limpid, tho' mucilaginous Serum, called Lympha by Anatomiſts. But as they have likewiſe been obſerved to be filled with a white milky Fluid, called Chyle, they have been called Vaſa Chylifera, or Venæ Lacteæ. They have the name of Veins, becauſe their Valves are diſpoſed as thoſe of the ordinary Blood-Veins, and becauſe the Fluid which they contain, runs from ſmaller into larger Tubes.

214. I have always divided the lacteal Veſſels into three Claſſes in the Human Body, and ſometimes into four.

215. They derive their firſt Origin from the Tunica Villoſa of the Inteſtines, and chiefly from that of the ſmall Inteſtines, by a great number of ſmall capillary Roots, as has been already ſaid. From theſe Roots there ariſes between the Coats of the Inteſtines, a kind of Rete Mirabile, which ſurrounds almoſt the whole Circumference of the inteſtinal Canal, between the muſcular and external Coat.

216. This reticular Texture of lacteal Veſſels keeps cloſe to the external Coat, and leaves the Canal along with it, on the ſide of the Meſentery, where it forms two Planes of Ramifications, plainly diſtinguiſhed from each other by the cellular Subſtance, and adhering cloſely to the inſide of the two Membranes of the Meſentery. In this ſeparate State, they run on the Laminæ of the Meſentery, as far as the firſt Meſenteric Glands, where they unite again into one Plane. All this I reckon the firſt Claſs of Lacteals.

217. After this Union, the lacteal Veſſels are diſtributed almoſt uniformly through the whole Extent of the Meſentery from its Circumference to its Origin or Adheſion to the Vertebræ of the Back, between the Meſenteric Glands, which they join in the manner already ſaid, and form frequent Anaſtomoſes or Communications. This is the ſecond Claſs.

218. Having paſs'd through the Meſentery in this manner, the Ramifications begin to unite as they approach the Spina Dorſi, and conſequently their Number is leſſened, and their Size increaſed; and having paſſed the laſt Meſenteric Glands, they terminate about the middle of the Adheſion of the Meſocolon in ſmall common Trunks, which receive a great number of Lymphatic Veſſels from the Glandulæ Lumbares, and others below theſe. This is the third Claſs.

219. A fourth Claſs may be made of the lacteal Veſſels of the great Inteſtines; of which I demonſtrated ſeveral very full of Chyle, to the Royal Academy, in an Human Colon. The late M. *Mery* a Member of the ſame Academy, who was not eaſily convinced of any thing, from Obſervations made

by others, having ſeen that with the end of my Finger, I could puſh the white Liquor uniformly into the Colon in ſeveral places, ſeem'd at firſt to be ſatisfied; but for his farther Conviction, he deſired me to open one of theſe Veſſels before him, with the Point of a Lancet, and to take out a Drop of the Liquor, which having laid upon the Nail of my Thumb, he was intirely convinced.

220. The lacteal Veſſels are not always apparent in Human Subjects. But we may ſee them in thoſe who die either a violent or ſudden Death, ſoon after a Meal; and they remain viſible even in the Inteſtines, for a long time after Death, when a great number of the Meſenteric Glands have become Scirrhous, eſpecially in Children.

221. It is the common Cuſtom to demonſtrate the Lacteals in living Animals, opened about three Hours after a full Meal, eſpecially of Milk. This is a very troubleſome way, and very often hinders us from ſeeing a great part of this beautiful Phænomenon. It is much eaſier and better to kill the Animal about an Hour after it has filled its Belly, or ſooner, if the Food be liquid; and this is the Method which I have always uſed with ſucceſs, in my private Courſes.

*Receptaculum Chyli.*

222. The lacteal Veſſels of the third Claſs, or thoſe that lie between the Meſenteric Glands and middle Adheſion of the Meſocolon to the Spina Dorſi, run down on the Body of the inferiour Aorta, between the Extremities of the ſmall Muſcle of the Diaphragm, and terminate in a kind of Ciſtern, call'd by ſome Receptaculum Chyli, by others Receptaculum Pecqueti, from M. *Pecquet* a Phyſician at *Dieppe* in *Normandy*, who firſt demonſtrated by inconteſtable Experiments, this Receptacle, which had been long before diſcovered by *Euſtachius.*

223. The greateſt part of the Receptaculum Chyli lies behind the right Portion of the inferiour Muſcle of the Diaphragm, on the right ſide of the Aorta, at the Union of the laſt Vertebra of the Back with the firſt of the Loins. It is a kind of membranous Veſicle, the Conformation of which is various in Human Subjects. Sometimes it is of an uniform long oval figure, like the Veſicula Fellis; ſometimes it is divided by Strictures, into ſeveral ſmall roundiſh Bags more or leſs flatted, and ſometimes it ſurrounds the Trunk of the Aorta like a Collar.

224. It is compoſed of very thin Coats, and its Cavity is divided by ſmall Pelliculæ or membranous Septa, the Diſpoſition of which is irregular. It is chiefly round the lower part of this Receptacle, that the laſt Lacteal Veſſels are inſerted, ſome on the ſides, and ſome behind the Aorta; and they are accompanied by numerous lymphatic Veſſels, of which in another place. The upper Portion is contracted between the Aorta and Vena Azygos, and forms a particular Canal, which runs up through the Thorax, by the name of Ductus Thoracicus, which ſhall be deſcribed in the next Section.

### §. 11. *The Blood-Veſſels and Nerves of the Inteſtines.*

*Blood-Veſſels of the Inteſtines.*

225. The Duodenum has commonly a particular Artery called Duodenalis or Inteſtinalis, which comes indifferently from the Stomachica Coronaria, Pylorica, Gaſtrica Major or Hepatica. It has likewiſe ſeveral diſtinct Ramifications from theſe Trunks, and from the Meſenterica Superior and Splenica, which Ramifications communicate with each other.

226. The Arteria Duodenalis, and the other additional ſmall Arteries, form a vaſcular Network round the muſcular Coat of the Inteſtine, which ſends out a great number of Capillaries towards both the outer and inner ſides, that make the whole Inteſtine look of a red Colour.

227. The Veins of the Duodenum are Rami of the Vena Portæ, and the Diſtribution and Denomination thereof, is pretty much the ſame with that of the Arteries; only they communicate more with each other, than the Arteries, and alſo with the great Hæmorrhoidal Vein.

228. The venal Ramifications form round the Duodenum, a Network like that of the Arteries; and the ſame kind of vaſcular Texture is more or leſs to be found on all the other Inteſtines.

229. The Arteries of the Jejunum come chiefly from the Meſenterica ſuperior; and ſome, from the aſcending Branch of the Meſenterica inferior. The Veins are for the moſt part Branches of the great Meſaraica; and the reſt come from the Splenica and ſmall Meſaraica or Hæmorrhoidalis Interna.

230. The principal ſubaltern Trunks of theſe Arteries and Veins accompany each other through the cellular Subſtance, between the Laminæ of the Meſentery, are diſtributed by Branches and Rami, and form the Maſhes, Lozenges and Arches mentioned in the Deſcription of the Arteries and Veins. The laſt of theſe Arches and Lozenges, or thoſe next to the Inteſtine, produce two ſmall vaſcular Planes, which ſeparate from each other very diſtinctly, and ſurround the inteſtinal Canal in a reticular manner.

231. The Blood-Veſſels of the Ileum come from the ſame Sources with thoſe of the Jejunum, as has been ſaid in the Hiſtory of the Arteries and Veins; and it ought to be obſerved concerning both theſe Veſſels, and thoſe of the Jejunum, that in their whole Courſe through the Meſentery, they give Ramifications to the Glands, Laminæ and cellular Subſtance of the Meſentery; and alſo that there is a kind of Communication between ſeveral ſmall Meſaraic Veins, and the capillary Rami of the Venæ Lumbares and Spermaticæ.

232. The Arteries of the Cæcum and Appendicula Vermiformis, are Ramifications of the laſt Branch from the convex ſide of the Meſenterica ſuperior; and they have likewiſe ſome ſmall ones from the ſecond and third Branches, when both are found. The Veins of theſe two Parts are Ramifications of the great Meſaraica, and one of theſe Rami is by *Riolan* termed Vena Cæcalis.

233. The ſtreight Portion of the Arch of the Colon, or that which is an immediate Continuation of the Cæcum, is ſupplied with Arteries by the ſecond

Branch that comes from the concave ſide of the Meſenterica ſuperior, and likewiſe a little by the third, when there is a third.

234. The ſuperiour or middle Portion of the Arch of the Colon, is furniſhed by the firſt Branch from the ſame ſide of the Meſenterica ſuperior, which by a Bifurcation communicates on both hands, with the other Portions of the Arch of the Colon.

235. The left Portion of this Arch derives its Arteries partly from the firſt Branch of the ſame Meſenterica, and partly from that of the Meſenterica inferior, which two Branches form the celebrated Communication or common Arch of the two Meſentericæ.

236. By means of this Communication or Continuation, in caſe one Artery ſhould be obſtructed or compreſſed, the other would furniſh Blood to all the Branches below the place of the Obſtruction. The ſecond Branch of the Meſenterica inferior gives likewiſe ſmall Arteries to the left Extremity of the Colon.

237. The deſcending Convolutions of the Colon, which repreſent a *Roman* S, are ſupplied by the other Branches of the Meſenterica inferior, the laſt of which forms the Hæmorrhoidalis interna.

238. The Veins of all theſe Portions of the Colon, are Branches and Ramifications of the Vena Portæ Ventralis, and principally of the ſubaltern Trunks, the Meſaraica Major, and Meſaraica Minor or Hæmorrhoidalis Interna. The Diſtribution of theſe Branches and Ramifications, is in ſome meaſure the ſame with that of the Arteries, as may be ſeen in the Deſcription of the Veins.

239. The Arteries of the Rectum are furniſhed by the Hæmorrhoidalis Interna, the laſt Branch of the Meſenterica inferior, which communicates with the Hypogaſtrica, and particularly with the Hæmorrhoidalis externa, a Production of one of theſe Arteries.

240. The Veins of the Rectum are Ramifications of the laſt Branches of the Meſaraica Minor or Hæmorrhoidalis Interna, and they communicate with the Hæmorrhoidalis Externæ, which are Rami of one of the Hypogaſtricæ. They communicate likewiſe with the capillary Ramifications of the other Hypogaſtric Veins, which go to the internal Parts of Generation of both Sexes.

241. It is here to be obſerved in general, that there is a ſucceſſive Continuation more or leſs ſimple or multiplied, between all the Arteries of the inteſtinal Canal, and likewiſe between all the Veins; and alſo that the Veins are here thinner and more capacious than the Arteries in a greater proportion than in the other Parts of the Body.

*Nerves of the Inteſtines.*

242. The Nerves of the Duodenum are the middle Plexus of the ſemilunar Ganglion, and ſome Filaments of the Plexus Stomachicus and Hepaticus.

243. The Nerves of the Jejunum, Ileum, and Meſenteric Glands, are the Plexus Meſentericus ſuperior, the poſterior Meſenteric Faſciculi, and the Plexus Meſentericus inferior.

244. The Nerves of the Cæcum are the poſterior Meſenteric Faſciculi or Plexus, and the Plexus Meſentericus inferior.

245. The Nerves of the Arch of the Colon are the ſame Faſciculi, and the two Plexus Meſenterici.

246. The Nerves of the laſt Convolutions of the Colon are the poſterior Meſenteric Faſciculi, and the Plexus Meſentericus inferior, and Sub-Meſentericus.

247. The Nerves of the Rectum are the Plexus Meſentericus inferior, Plexus Sub-Meſentericus or Hypogaſtricus, and the two Ganglions of that Plexus.

248. The Nerves of the Anus, and of its Muſcles, are the Ganglions of the Plexus Sub-Meſentericus, the inferiour Rope of both Sympathetici Maximi, and the common Arch of the Extremities of both Ropes.

249. Before I proceed to the Liver, it muſt be remarked that the Omentum and Appendices Adipoſæ have ſo near a relation to the Liver and Spleen, that it is impoſſible to deſcribe them without mentioning ſeveral Things belonging to theſe two Viſcera; and therefore, I think it more proper to give the Hiſtory of theſe, after that of the other two, and even of the Pancreas, than to begin the Hiſtory of the Parts contained in the Cavity of the Abdomen by that of the Omentum, as is commonly done.

250. For the ſame reaſon, I ſhall not give the Uſes of theſe Parts, till after they have been all explained; and together with theſe Uſes, I ſhall ſpeak to thoſe of the inteſtinal Canal, Meſentery, Vaſa Lactea, Meſenteric Glands, Muſcles of the Anus, *&c.*

## §. 12. *Hepar & Veſicula Fellis.*

*Situation, Figure and Diviſion of the Liver.*

251. The Liver is a large and pretty ſolid Maſs, of a dark red Colour, a little inclined to yellow, ſituated immediately under the Arch of the Diaphragm, partly in the right Hypochondrium, which it fills almoſt intirely, and partly in the Epigaſtrium, between the Appendix Enſiformis and Spina Dorſi, and terminating commonly in the left Hypochondrium, into which it ſometimes runs a conſiderable way.

252. The Figure of the Liver is irregular, it being arched or convex on the upper part, unequally concave on the lower, and very thick on the right and back ſides. Towards the left and anteriour ſides its thickneſs decreaſes very much, and terminates there by a kind of Edge; and it is broader from right to left, than from before backwards.

253. The Liver may be divided into two Extremities, one great, the other ſmall; two Edges, one anteriour, and one poſteriour; two Sides, one ſuperior and convex, which is ſmooth, poliſhed and proportioned to the Arch of the Diaphragm, and one inferiour, concave and uneven, with ſeveral Eminences and Depreſſions, of which hereafter.

254. It may likewiſe be divided into two lateral Parts called Lobes; one of which is termed the great or right Lobe, the other, the ſmall or left Lobe. Theſe two Lobes are diſtinguiſhed above, by a membranous Ligament; and below very plainly, by a conſiderable Sciſſure lying in the ſame Direction with the ſuperiour Ligament.

255. The Eminences on the concave ſide of the Liver belong to the great Lobe. The principal Eminence is a ſort of triangular or pyramidal Apophyſis ſituated backward near the great Sciſſure which diſtinguiſhes the two Lobes.

256. This triangular Eminence is termed Lobulus Spigelii, or ſimply the ſmall Lobe of the Liver. One of its Angles advances a conſiderable way toward the middle of the lower ſide of the great Lobe, and is loſt there. This Angle I call the Root of the Lobulus. Toward the foreſide, there is another Eminence leſs prominent but broader; and to this Eminence and the former, the Ancients gave the general Name of Portæ.

257. The Depreſſions on the concave or lower ſide of the Liver, which deſerve our Attention, are four in number. The firſt is the Sciſſure that ſeparates the two Lobes, which runs a-croſs the concave ſide, from the Eminences already mentioned to the anteriour Edge, where it terminates by a Notch of different Depths in different Subjects. This is termed the great Sciſſure of the Liver; and in ſome Subjects, part of it is an intire Tube.

258. The ſecond Depreſſion is ſituated tranſverſely between the two Eminences of the great Lobe, and filled by the Sinus of the Vena Portæ, ſo called by the Ancients, becauſe it lies between the Eminences of the ſame Name. The third Depreſſion is backward, between the great Lobe and Lobulus Spigelii, and the Vena Cava paſſes through it. The fourth is a kind of Sulcus between the Lobulus and ſmall Lobe of the Liver, which in the Fœtus ſerved to receive a venal Canal loſt in Adults, in whom it appears only as a kind of Ligament. This Sulcus is in ſome meaſure a Continuation of the great Sciſſure, and joins the Vena Cava by an acute Angle.

259. Besides theſe four Depreſſions, there is one on the Fore-part of the great Lobe, in which the Veſicula Fellis is lodged, and it ſometimes runs as far as the Edge, where it forms a ſmall Notch. We may likewiſe reckon among theſe Depreſſions, a ſmall ſuperficial Cavity in the poſteriour and lateral Part of the lower ſide of the great Lobe, by which it reſts on the right Kidney; and likewiſe a ſuperficial Cavity in the left Lobe, where it runs over the Stomach.

260. Lastly, on the poſteriour Edge of the Liver, there is a great Sinus common to both Lobes, which gives paſſage to the Spina Dorſi and Œſophagus, near the place where the Vena Cava deſcends; and we ſometimes meet with Sciſſures on both ſides of the Liver, which are not ordinary.

*Ligaments of the Liver.* 261. The convex ſide of the Liver, is commonly connected to the Diaphragm by three Ligaments, which are only Continuations of the Membranous Lamina of the Peritonæum. One lies near the Edge of the Extremity of each Lobe, and one in the middle, and they are accordingly termed the right, middle and left Ligaments. There is a cellular Subſtance in the Duplicature of each, in which the Blood-Veſſels and Lymphatics run, and which ſends off a kind of Lamina into the Subſtance of the Liver.

262. The right Ligament ſometimes connects the great Lobe to the Cartilages of the falſe Ribs, and the left Ligament, or that of the ſmall Lobe is often double, and advances toward the middle Ligament. This

middle Ligament begins low, in the great Sciſſure of the Liver, near the Eminences called Portæ, and from thence paſſes through the anterior Notch and over the convex ſide of the Liver at the Union of the two Lobes, and is fixed obliquely in the Diaphragm.

263. It is likewiſe fixed along the upper and inner Part of the Vagina of the right Muſculus Rectus of the Abdomen, in ſuch an oblique manner as to be nearer the Linea Alba below than above.

264. Besides theſe Ligaments the great Lobe of the Liver is likewiſe connected to the right Ala of the tendinus Portion of the Diaphragm, not by a Ligament, but by a broad and immediate Adheſion, without the intervention of the Membrane of the Peritonæum, which is only folded quite round this Adheſion, to form the external Membrane of all the reſt of the Body of the Liver.

265. This broad Adheſion is commonly tho' improperly called Ligamentum Coronarium; but in the firſt place it is not a Ligament, as has been already obſerved, and ſecondly it is not circular, but Oval and very Oblong.

266. It is not on the upper part of the convex ſide of the Liver, but along the poſteriour part of the great Lobe, the broad Extremity of the Adheſion lying nearer the Notch, and the pointed Extremity towards the right Hypochondrium.

267. The middle Ligament called improperly Ligamentum Hepatis Suſpenſorium, contains in its Duplicature a thick white Rope, like a round Ligament, which was the Umbilical Vein in the Fœtus. Thus the lower part repreſents a Falx, the convex Edge of which is ſharp, and the other rounded.

268. All theſe Ligaments ſerve to keep the Liver in its proper Situation and to hinder it from inclining too much towards either ſide: but we muſt not imagine that any of them ſerve to ſuſpend it; becauſe it is ſufficiently ſupported by the Stomach and Inteſtines, eſpecially when they are filled.

269. When the Stomach is empty, or when we faſt longer than ordinary, it is a common Expreſſion to ſay the Stomach pinches us. As the Liver is not then ſuſtained by the Stomach and Inteſtines, it deſcends by its own weight, and chiefly by means of the middle Ligament pulls the Diaphragm along with it. It is in that place therefore that we have this uneaſy Senſation, and not at the ſuperiour Orifice of the Stomach, as is commonly believed.

270. The right or great Lobe of the Liver which lies in the right Hypochondrium, reſts on the right Kidney, by a ſmall ſuperficial Depreſſion abovementioned; and it likewiſe covers a Portion of the Arch of the Colon and the Pylorus. About two third Parts of the ſmall or left Lobe, lie in the Middle of the Epigaſtrium, and the remaining third Part advances over the Stomach, towards the left Hypochondrium.

271. This ſmall Lobe is ſituated almoſt Horizontally; the great Lobe is very much inclined, and its thick Extremity runs down almoſt in a perpendicular Direction to the right Kidney, on which it lies, in the manner

already ſaid. This Obſervation is of uſe to diſtinguiſh the different Parts of the Liver in Wounds and Chirurgical Operations.

272. It may likewiſe ſerve to direct us in examining a Liver taken out of the Body; the Situation of which may be otherwiſe very eaſily miſtaken, eſpecially that of the Parts of the concave ſide. The Paſſage of the Vena Cava, between the Body of the great Lobe and the Lobulus Spigelii, may likewiſe ſerve for a Rule in placing a detached Liver in its true Situation.

*Structure of the Liver.*

273. The Liver is compoſed of ſeveral kinds of Veſſels, the Ramifications of which are multiplied in an aſtoniſhing manner, and form by the Intertexture of their Capillary Extremities, an innumerable Collection of ſmall pulpy, friable Corpuſcles, which are looked upon to be ſo many Organs deſign'd to ſeparate from the Maſs of Blood, a particular Fluid termed the Bile.

274. The greateſt part of theſe Veſſels from one end to the other is included in a Membranous Vagina called Capſula Venæ Portæ, or Capſula Gliſſoni, from an *Engliſh* Author who firſt deſcribed it particularly.

275. The Veſſel which carries the Blood to the Liver is called Vena Portæ for the reaſon already given. In the Deſcription of the Veins, I obſerved that the Vena Portæ might be conſidered as two large Veins, the Trunks of which are joined endwiſe, and ſend out Branches and Ramifications in oppoſite Directions to each other; that one of theſe Veins is ramified in the Liver, the other lying without the Liver and ſending its Branches and Ramifications to the Viſcera of the Abdomen; and laſtly, that the firſt of theſe large Veins may be termed Vena Portæ Hepatica, the other Vena Portæ Ventralis.

*Vena Portæ Hepatica.*

276. The particular Trunk of the Vena Portæ Hepatica is ſituated tranſverſely between the broad anteriour Eminence of the great Lobe of the Liver, and the Root of the Lobulus, in a particular Sciſſure, and forms what is called the Sinus of the Vena Portæ. From this Sinus five principal Branches go out, which are afterwards divided into Millions of Ramifications through the whole Subſtance of the Liver.

277. At this place, the Vena Portæ lays down the common Office of a Vein, and becomes a kind of Artery as it enters and is again ramified in the Liver. The Extremities of all theſe Ramifications of the Trunk of the Vena Portæ Hepatica, end in the pulpy friable Corpuſcles which ſeem to be thick Villous Folliculi, when examined through a Microſcope in clear Water.

*Pori Bilarii & Ductus Hepaticus.*

278. It is in theſe Folliculi that the Bile is ſecreted, and it is immediately collected in the ſame number of Extremities of another kind of Veſſels, which unite by numerous Ramifications into one common Trunk. Theſe Ramifications are termed Pori Bilarii, and the Trunk, Ductus Hepaticus; and the Ramifications of theſe two kinds of Veſſels are inveſted together by the Capſula of the Vena Portæ.

*Hepatic Veins.*

279. The Blood deprived of this Bilious Fluid is reconveyed to the Heart, by a great number of venal Ramifications, which afterwards unite into three principal Branches, beſides others that are leſs conſiderable, that

terminate in the Vena Cava, and are all called by the Name of Vena Hepatica.

280. The capillary Extremities of the Ramifications of the Vena Cava, join thoſe of the Vena Portæ, and accompany them through the Liver; and yet the great Branches of both Veins interſect each other in ſeveral places.

281. When we cut the Liver in Slices, it is eaſy to diſtinguiſh in each Slice, the Ramifications of the Vena Cava from thoſe of the Vena Portæ; the firſt being thinneſt and largeſt, and adhering cloſeſt to the Subſtance of the Liver: whereas thoſe of the Vena Portæ which are inveſted by the cellular Capſula, appear to be a little ruffled when empty; becauſe the cellular Capſula ſubſides, when it is cut, but the other Veins remain uniformly open, their Sides adhering to the Subſtance of the Liver.

*Hepatic Artery and Nerves.*

282. The Liver receives from the Arteria Cælica a particular Branch termed Arteria Hepatica, which being very ſmall, when compar'd with the Bulk of that Viſcus, ſeems deſigned only for the Nouriſhment thereof, and not for the Secretion of the Bile. The Plexus Hepaticus formed by the Nervi Sympathetici Maximi & Medii, furniſhes a great number of Nerves to the Subſtance of the Liver. The Ramifications of the Artery and Nervous Plexus are included in the cellular Capſula together with thoſe of the Vena Portæ and Pori Bilarii.

283. The Pulſation of this Artery has been by ſome Anatomiſts taken for that of the Capſula, and by this they have endeavoured to explain the arterial Function of the Vena Portæ: but they have not conſidered that the Blood in this Vein does not require to be pumped forward; becauſe ſo ſwift a Motion would have been prejudicial to the Secretion of the fine Oil of the Bile, for which a ſlow and almoſt inſenſible Motion is neceſſary.

284. The Liver is cover'd exteriourly by a particular Membrane or Coat, which is a Continuation of the Peritonæum. There is likewiſe a membranous or filamentary Subſtance that runs thro' this whole Viſcus, and connects the Ramifications and Extremities of all its Veſſels to each other. This Subſtance ſeems to be a complicated Production of the Capſula of the Vena Portæ and of the external Membrane of the Liver.

285. The outer Surface of this Coat is very ſmooth, but its inner Surface is uneven, being made up of a great number of thin membranous Laminæ, between which we obſerve very diſtinctly, numerous lymphatic Veſſels, on both the convex and concave Sides of the Liver; but it is more difficult to trace thoſe which accompany the filamentary Subſtance through that Viſcus.

286. I have already obſerved that the Subſtance of the Liver is chiefly made up of an infinite number of pulpy friable Corpuſcles, each of which is bounded and in a manner ſurrounded by a particular Expanſion of the Capſula Gliſſoni, and all theſe Expanſions are connected by common Septa, in ſome meaſure reſembling a Bee-hive.

287. These Corpuſcles have ſeveral Angles eſpecially in the inner Surface of the Liver; but near the Surface they are raiſed in the form of ſmall Tubercles. Their pulpy Texture appears like radiated Villi, a ſmall void ſpace being left in the middle of each.

288. If we blow through a Pipe into the Vena Portæ, Vena Cava, Arteria Hepatica, or Trunk of the Pori Bilarii, but eſpecially through the two Veins, we obſerve the Liver to ſwell, and the Corpuſcles near the Surface are raiſed, and become more ſenſible. If we blow with much Force, we burſt theſe Corpuſcles, and the Air getting between them and the external Membrane, raiſes it from the Subſtance of the Liver in Bliſters.

*Ductus Cholidochus.* 289. The Ductus Hepaticus, or Trunk of the Pori Bilarii, having run a little way, joins another Canal called Ductus Cyſticus or Veſicularis, becauſe it comes from the Veſicula Fellis, as we ſhall ſee in the Deſcription of that Organ. Theſe two united Ducts form a common Trunk named Ductus Cholidochus, becauſe it conveys the Bile. This Duct having reached the Incurvation of the Duodenum, inſinuates itſelf through the Coats of that Inteſtine, and opens into the Cavity thereof, not by a round Papilla, but by an oblong Orifice rounded at the upper part and contracted at the lower, like the Spout of an Ewer, or like a common Tooth-picker.

290. The Edges of this Orifice are raiſed, broad and plaited, as we may ſee by making this Portion of the Duodenum ſwim in clear Water. At the Entry of this Orifice we ſee another ſmaller opening diſtinct from it, which is the Orifice of the Ductus Pancreaticus, of which hereafter.

*Veſicula Vellis.* 291. The Gall-Bladder is a kind of ſmall Bag ſhaped like a Pear, that is, narrow at one end and wide at the other. The wide Extremity is termed the Fundus or Bottom, the narrow Extremity the Neck, and the middle Portion, the Body. About one third of the Body of the Veſicula lies in a Depreſſion on the concave ſide of the Liver, from the Trunk or Sinus of the Vena Portæ, where the Neck is ſituated, to the anteriour Edge of the great Lobe, a little toward the right ſide, where the Bottom is placed, and in ſome Subjects it advances beyond the Edge.

292. Therefore when we ſtand, the Veſicula Fellis lies in a Plane inclined a little from behind forward. When we lie upon the Back, it is almoſt inverted. When we lie on the right ſide, the Bottom is turned downward; and it is turned upward when we lie on the left ſide; and theſe Situations vary according to the different Degrees of each Poſture.

293. The Gall-Bladder is compoſed of ſeveral Coats; the outermoſt of which is a Continuation of that which inveſts the Liver, and conſequently of the Peritonæum.

294. The ſecond Coat is fleſhy and made up of two Strata, one longitudinal, the other tranſverſe, the Fibres of which have nearly the ſame irregular Direction with thoſe of the Stomach; and this Diſpoſition of the Fibres in theſe Viſcera is owing to the different Diameters in the ſeveral Portions of them, and to their Incurvation.

295. These two Coats are connected by a cellular Subſtance continued between the Body of the Veſicula and the Liver, all the way to a whitiſh Stratum, which is look'd upon as the third Coat of the Gall-Bladder anſwering to the Tunica Nervoſa of the Inteſtines.

296. The innermoſt or fourth Coat has on the inſide a great number of reticular Folds, filled with ſmall Lacunæ, like perforated Papillæ, eſpecially

cially near the Neck of the Veſicula where theſe Folds are longitudinal, and afterwards form a kind of ſmall Pylorus with Plaits of the ſame nature with thoſe in the great one. Theſe Lacunæ are look'd upon to be Glands.

297. That Side of the Body of the Veſicula which lies next the Liver is connected to that Viſcus by a vaſt number of Filaments, which run a great way into the Subſtance of the Liver; and among theſe Filaments there are ſome Ducts which form a Communication between the Pori Bilarii and Veſicula. Theſe Ducts have been obſerved in Brutes a long time ago, and they have been very lately diſcover'd in Men likewiſe. They are moſt numerous near the Neck of the Veſicula, and they are named Ductus Cyſt-Hepatici, or Hepatico-Cyſtici.

298. The Neck of the Veſicula is formed by the Contraction of the ſmall Extremity; and this Neck bending afterwards in a particular manner, produces a narrow Canal named Ductus Cyſticus. This Incurvation repreſents in ſome meaſure the Head of a Bird, of which the Cyſtic Duct, by the gradual Diminution of its Diameter, expreſſes the Beak. This cannot be ſeen when the Liver is extra Situm; and even in Situ it is but very imperfectly ſeen, when in order to view the concave Side, the Liver is raiſed and thruſt too much againſt the Diaphragm; for by thus inverting the Liver, the Curvature is diſordered, and we ſee two in the place of one.

299. To ſee this Curvature in its true natural Situation, the Liver is to be raiſed but very little, and the Duodenum left untouched; then we muſt ſtoop and look under the Liver without diſordering any thing. This Incurvation may be of uſe to hinder too precipitate a Diſcharge of the Bile contained in the Veſicula, which ſome Situations of the Body might occaſion.

300. The Neck of the Veſicula is nearly of the ſame Structure with the other Parts. It has on the inſide ſeveral reticular Rugæ and ſome Folds which appear like Fragments of Valvulæ Conniventes, ſituated very near each other, from the very Neck to the Contraction of the Cyſtic Duct. The firſt of theſe Folds is pretty broad and large, and almoſt circular; the next is more oblique and ſmaller in ſize, and the reſt diminiſh in the ſame manner. Taken all together, they form a kind of ſpiral Flight, which may be ſeen through the Neck on the outſide, where it ſometimes appears like a Screw, eſpecially when the Neck is filled with any Fluid. This Obſervation is owing to M. *Heiſter*.

301. By ſlitting the Neck and Duct we ſee all theſe Folds very diſtinctly, eſpecially when we examine them in clear Water. When they are viewed in any other manner, they eaſily deceive us, being miſtaken for true Valves becauſe of their tranſverſe Situation. They may however, in ſome meaſure ſupply the place of Valves by hindering the Bile from running too faſt into the Duodenum, and the Contents of the Duodenum from entering this Duct.

302. The internal Surface of all theſe biliary Ducts, that is, of the Ductus Hepaticus, Cyſticus and Cholidochus, being examined through a Microſcope in clear Water, appears to be nearly of the ſame Structure, through their whole Extent.

303. The cyſtic and hepatic Ducts do not in their ordinary and natural Situation repreſent the capital Y of the *Greeks*, where they form the Ductus Cholidochus. After the Incurvation of the Neck of the Veſicula, theſe two Ducts run very near each other, and they appear to be ſeparated, only by raiſing up the Liver to view them. The ſame Diſorder happens in an inverted Liver extra Situm; for then the Body of the Liver ſubſides and is flatten'd, and thereby ſeparates the Ducts; whereas in its true Situation, it is very much incurvated, and the Ducts very near each other.

304. The Ductus Cholidochus appears rather to be a Continuation of the Ductus Cyſticus, than the common Trunk of that and of the Ductus Hepaticus; for I have obſerved that this laſt Duct runs for ſome ſpace within the Sides of the former, before it opens into the Cavity, much in the ſame manner as the Ductus Cholidochus paſſes into the Duodenum. I have likewiſe obſerved at the opening of the Hepatic into the Cyſtic Duct, a ſmall looſe valvular Membrane, which may hinder the Bile from returning out of the Ductus Cholidochus into the Hepaticus.

305. The Bile which paſſes through the Ductus Hepaticus into the Cholidochus, may be called Hepatic; and that which is collected in the Veſicula Fellis, may be termed Cyſtic. The hepatic Bile flows continually through the Ductus Cholidochus into the Duodenum, whereas the cyſtic Bile flows only by reaſon of Plenitude or by Compreſſion.

*Remarks on the Veſſels, &c. of the Liver.*

306. The Trunk of the Vena Portæ Ventralis terminates between the Lobulus and the oppoſite part of the great Lobe; and there joins the Trunk of the Vena Portæ Hepatica in the tranſverſe Sinus of the Liver, between the right Extremity, and the middle of that Sinus.

307. The umbilical Ligament and conſequently the umbilical Vein in the Fœtus joins the Trunk of the Vena Portæ Hepatica, toward the left Extremity of the tranſverſe Sinus of the Liver. The Canalis Venoſus in Man is not exactly oppoſite to the Vena Umbilicalis, but a little to the right hand, and therefore theſe three Veſſels lie in ſuch a Direction as to form two oppoſite Angles, reſembling thoſe of the Handle of a Wheel or of a Spit.

308. In the Fœtus therefore, the Blood which comes from the umbilical Vein does not run directly through that contained in the Vena Portæ Hepatica in the Sinus, and from thence into the Canalis Venoſus; but is obliged to turn from left to right, and ſo to mix with the Blood in the Vena Portæ, before it enters that Canal which opens into the Trunk of one of the great hepatic Veins of the Vena Cava near the Diaphragm.

309. The hepatic Vena Portæ gives off commonly five large Branches into the Liver, viz. three from its right Extremity into the great Lobe, and two from its left Extremity into the ſmall Lobe; and from the Interſtice between theſe, a ſmall Branch goes directly to the middle of the convex ſide of the Liver.

310. The hepatic Veins are commonly three large Branches of the Trunk of the Vena Cava Inferior, which go out from it by one common Opening, eſpecially two of them, and then ſeparating, they enter the Subſtance of the Liver, interſecting the Branches of the hepatic Vena Portæ, and are ramified in all Directions in the manner already explained. The inferiour Portion

tion of the opening of theſe Veins into the Vena Cava, forms a kind of ſemilunar Valve.

311. Below theſe Hepatic Veins, the Vena Cava inferior ſends off in its paſſage by the Liver, ſeveral other ſmall Hepatic Veins immediately from the Trunk, which ſeem to have the ſame Relation to the Hepatic Artery as the great Veins to the Vena Portæ.

312. The Paſſage of the Vena Cava is through the right Portion of the poſteriour Sinus of the Liver, and conſequently on the ſide of the great Lobe, which is hollow'd at this place ſufficiently to give paſſage to the Vein, of which it ſurrounds about three fourths, ſometimes more, and ſometimes the whole.

313. This Paſſage anſwers to the Interſtice between the Lobulus and the reſt of the great Lobe; and its Direction is in the natural State, from above downward, and a little from right to left: but when the Liver is view'd extra Situm, and inverted, it appears very oblique; but ſtill it ſerves as a Guide to beginners, who are very apt to be miſtaken in examining an inverted Liver, as I have already obſerved.

314. The Trunk of the great Vena Portæ, the Hepatic Arteries, the Ductus Hepaticus, or Trunk of the Pori Bilarii, and the Nerves of the Plexus Hepaticus, form all together a large Bundle, before they enter the Liver. The Trunk of the Hepatic Vena Portæ is in the middle of this Bundle, the Hepatic Arteries lie on the right and left ſides of this Trunk, the Nerves ſurround it on all ſides, and they communicate with the Plexus Meſentericus ſuperior.

315. Afterwards the firſt Branches of the Arteries, Nerves and Pori Bilarii, leave the Trunk of the great Vein, and join in the ſame manner, the Trunk of the ſmall or Hepatic Vena Portæ and its Ramifications in the Capſula Gliſſoni explained above.

316. All theſe Branches of the Vena Portæ, and of the Arteries, Nerves and Pori Bilarii, accompany each other by Ramifications through the whole Subſtance of the Liver, forming every where ſmall Faſciculi in the ſame manner as the large Bundle is formed by their Trunks. Each Ramus of the Vena Portæ, Artery, Nerve, and Porus Bilarius has a proper Vagina, and all the four have a common Vagina diſtinguiſhed from the former by cellular Septa, which are only Continuations of the Vaginæ of both kinds.

317. The convex ſide of the common cellular Vagina is connected quite round, to the Subſtance of the Liver by numerous Filaments which ariſe from it, and which form the cellular Subſtance found between the glandular Corpuſcles. The concave ſide produces the cellular Septa above-mentioned.

318. In this common Vagina, the Veſſels, Ducts and Nerves are diſpoſed in ſuch a manner, as that the Rami of the Vena Portæ chiefly fill the Cavity of it, and is in a lateral Situation; the arterial Ramus and Porus Bilarius lie together on the ſide of the Vein, and the Nerve is divided into ſeveral Filaments, which run in between the Veſſels and Ducts, and chiefly accompany the Artery and Porus Bilarius; the Vena Portæ having by much the feweſt.

319. The Uſes of the Liver ſhall be explained after the Deſcription of the Pancreas, Spleen and Omentum, all theſe Viſcera having a great Relation to the Liver.

## §. 13. *Pancreas.*

*Figure, Diviſion, and Situation of the Pancreas.* 320. The Pancreas is a long flat Gland, of that kind which Anatomiſts call Conglomerate, ſituated under the Stomach, between the Liver and the Spleen. Its figure reſembles that of a Dog's Tongue, and it is divided into two ſides, one ſuperiour, the other inferiour; two Edges, one anteriour, the other poſteriour; and two Extremities, one large, which repreſents the Baſis of a Tongue, and one ſmall and a little rounded like the Point of a Tongue.

321. The Pancreas is ſituated tranſverſely under the Stomach in the Duplicature of the poſteriour Portion of the Meſocolon. The large Extremity is connected to the firſt Incurvation of the Duodenum, and from thence it paſſes before the reſt of that Inteſtine, all the way to its laſt Incurvation; ſo that a great part of the Duodenum lies between the Pancreas, and the Vertebræ of the Back. The ſmall Extremity is fixed to the Omentum near the Spleen.

*Structure of the Pancreas.* 322. The Pancreas is compoſed of a great number of ſoft glandular Moleculæ, combined in ſuch a manner, as to exhibit the Appearance of one uniform Maſs on the outſide, the Surface of which is rendered uneven, only by numerous ſmall Convexities, more or leſs flatted. When theſe Moleculæ are ſeparated a little from each other, we find along the middle of the Breadth of the Pancreas, a particular Duct, in which ſeveral ſmaller Ducts terminate laterally on each ſide, like ſmall Rami in a Stem.

323. This Canal, named Ductus Pancreaticus, or Ductus Virſungi, from the Diſcoverer of it in the Human Body, is very thin, white and almoſt tranſparent, and the Extremity of the Trunk opens commonly into the Extremity of the Ductus Cholidochus. From thence it diminiſhes gradually, and terminates in a Point, next the Spleen. The ſmall lateral Branches are likewiſe pretty large near the Trunk, and very ſmall toward the Edges of the Pancreas, all of them lying in the ſame Plane like the Branches of the common Filix or Fern.

324. The Pancreatic Duct is ſometimes double in Man, one lying above the other. It is not always of an equal length, and ſometimes runs in a winding Courſe, but always in the ſame Plane; and it is nearer the lower than the upper ſide of the Pancreas. It pierces the Coats of the Duodenum, and opens into the Ductus Cholidochus, commonly a little above the prominent Point of the Orifice of that Canal; and ſometimes it opens immediately into the Duodenum.

*The ſmall Pancreas.* 325. In Man, I obſerved ſeveral Years ago, that where the great Extremity of the Pancreas is connected to the Curvature of the Duodenum, it ſends down an Elongation, which adheres very cloſely to the following Portion of the Inteſtine; and upon a careful Examination, I found a particular

Pancreatic

Pancreatic Duct, ramified like the large one, which ran toward and interſected this great Duct, into the Extremity of which it open'd, after having perforated the Duodenum. This Portion I term Pancreas Minus, and it ſometimes opens ſeparately into the Duodenum, in which we likewiſe obſerve ſeveral ſmall Holes round the Ductus Cholidochus, which anſwer to the Pancreas.

*Blood-Veſſels, and Nerves of the Pancreas.*

326. The Arteries of the Pancreas come from the Pylorica, Duodenalis, and chiefly from the Splenica, which adheres very cloſely to the whole lower ſide of the Pancreas near the poſterior Edge; and it ſends off in its paſſage a great many Rami, named Arteriæ Pancreaticæ; which go off from each ſide, more or leſs tranſverſely. It receives alſo ſome ſmall Ramifications from the Gaſtrica major, and Meſenterica ſuperior.

327. The Pancreatic Veins are Rami of the Splenica, one of the principal Branches of the Vena Portæ Major or Ventralis. This Vena Splenica runs likewiſe along the lower ſide of the Pancreas near the Edge, in a ſhallow Depreſſion, formed in the Subſtance of the Gland. Theſe Veins anſwer to the Arteries of the ſame Name, and there are likewiſe other ſmall Veins correſponding to the ſmall Arteries, which are Productions of the great Meſaraica, *&c.*

328. The Nerves of the Pancreas come partly from the Plexus Hepaticus, partly from the Plexus Splenicus, and partly from the Plexus Meſentericus ſuperior, and it likewiſe receives ſome from the flat Ganglion or Plexiform Intertexture, ſpoken to in the Deſcription of the Nerves, N° 413. and mentioned by the Name of the tranſverſe Rope, N° 140.

329. The Pancreatic Duct is not only double in ſome Subjects, as has been ſaid, but the collateral Branches have Communications in form of Iſlands in ſeveral places, within the Body of the Pancreas. The Uſes of this Viſcus ſhall be explained hereafter.

## §. 14. *Lien.*

*Situation, Diviſion and Figure of the Spleen.*

330. The Spleen is a bluiſh Maſs, ſomething inclined to red, and of a ong oval Figure, being about ſeven or eight Fingers breadth in length, and our or five in breadth. It is of a ſoftiſh Subſtance, and is ſituated in the left Hypochondrium, between the great Extremity of the Stomach, and the neighbouring falſe Ribs, under the Edge of the Diaphragm, and above the left Kidney.

331. It may be naturally divided into Sides, Edges and Extremities, as I have always done in my ordinary Courſes, for theſe many Years paſt. It has two ſides, one external and gently convex, and one internal, which is irregularly concave; two Extremities, one poſteriour, which is pretty large, and one anteriour, which is ſmaller and more depreſſed; two Edges, one ſuperiour, and one inferiour, on both which there are, in ſome Subjects, ſeveral Inequalities.

332. The inner or concave ſide is divided by a longitudinal Groove or Sciſſure, into two Planes or Half-ſides, one upper, the other lower; and by

this Groove, the Veſſels and Nerves enter in human Subjects. The ſuperiour half-ſide is broader and more concave than the inferiour, being proportioned to the Convexity of the great Extremity of the Stomach. The inferiour half-ſide lies backward on the left Kidney, and forward on the Colon; and ſometimes this ſide of the Spleen appears to have two ſuperficial Cavities, one anſwering to the Convexity of the Stomach, the other to that of the Colon. The convex ſide of the Spleen is turn'd to the left Ribs.

333. It is connected to the Stomach by the Veſſels called Vaſa Brevia; to the Extremity of the Pancreas by Ramifications of the ſplenic Artery and Vein, and to the Omentum by Ramifications which the ſame Artery and Vein ſend to the Spleen, and which run in the longitudinal Groove.

334. It is connected to the Edge of the Diaphragm by a particular membranous Ligament of different breadths in different Subjects, fixed in its convex ſide, ſometimes near the upper Edge, and ſometimes near the lower. This Ligament is ſituated tranſverſely with reſpect to the whole Body, and longitudinally with reſpect to the Size of the Spleen. In ſome Subjects it is connected by other Ligaments to the Stomach and Colon, but in all this there are conſiderable Varieties.

335. The Figure of the Spleen is not always regular, and is as various as the Size. Sometimes it has conſiderable Sciſſures both in the Sides and Edges, and ſometimes it has Appendices. I have ſometimes found a kind of ſmall diſtinct Spleens, more or leſs round, and connected ſeparately to the Omentum, at ſome diſtance from the anterior Extremity of the ordinary Spleen.

*Structure of the Spleen.*

336. The Structure of the Spleen is not eaſy to be unfolded in Man, and it is very different from that of the Spleens of Brutes, from which both publick and private Demonſtrations are commonly made.

337. Its Coverings adhere to it ſo cloſely in Man, that it is difficult to diſtinguiſh the common from the proper Coat; whereas in ſome Brutes, ſuch as Oxen, Sheep, &c. nothing is more eaſy; for in ſuch Animals we find two Coats ſeparated by a cellular Subſtance. This covering ſeems to be no otherwiſe a Continuation of the Peritonæum than by the intervention of the Omentum and Meſocolon; and even in Man the two Coats may be diſtinguiſhed, where the Veſſels enter by the longitudinal Sciſſure.

338. In Man the Subſtance of the Spleen is almoſt wholly Vaſcular, that is, compoſed of the Ramifications of all kinds of Veſſels. In Oxen the Subſtance of the Spleen is chiefly reticular, and in Sheep it is cellular. In Oxen and Sheep there are no venal Ramifications, but inſtead thereof only open Sinuſes diſpoſed like Branches, except a ſmall Portion of a venal Trunk perforated on all ſides, at the Extremity of the Spleen.

339. In the human Spleen we ſee ſomething like glandular Corpuſcles, as in thoſe of other Animals; and there are numerous venal Ramifications through its whole Extent. Between theſe Ramifications we every where obſerve an Appearaece of extravaſated Blood, lying in a kind of filamentary tranſparent and very delicate Subſtance expanded through the whole Spleen.

340. This filamentary Subſtance having ſurrounded all the Ramifications, terminates in almoſt imperceptible Cells which communicate with each other; ſo that if we blow through a ſmall Hole made in the membranous Covering, the whole Spleen will immediately be inflated.

341. The Surface of the Spleen of Oxen and Calves is viſibly full of a great number of lymphatic Veſſels, which may at any time be eaſily demonſtrated; but in Man it is a very difficult Matter either to diſcover or demonſtrate them.

*Blood-Veſſels and Nerves of the Spleen.*

342. The ſplenic Artery, which is one of the principal Branches of the Cœliaca, runs along the lower ſide of the Pancreas, as has been already ſaid, and paſſes from thence in a winding Courſe to the Spleen. The ſplenic Vein, which is larger than the Artery, is but little inflected in this part of its Courſe.

343. This Artery and Vein having got beyond the Extremity of the Pancreas, ſend out ſeveral Rami together, which immediately afterwards divaricate in the ſame Plane, run in the membranous Duplicature of the neighbouring Portion of the Omentum, and laſtly interſect each other in their common Plane, all the way to the Sciſſure of the inner or concave ſide of the Spleen.

344. These arterial and venal Rami enter the Subſtance of the Spleen together by the ſame Sciſſure; being accompanied by the cellular Subſtance belonging to the membranous Duplicature of the Omentum. We may likewiſe obſerve, that at this place the Coat of the Spleen ſends from its concave ſide, a Portion of a Lamina, which is incurvated in the Sciſſure and penetrates into the Subſtance of the Spleen.

345. The Nerves of the Spleen are very numerous, and come from the Plexus Splenicus, already deſcribed. Theſe Nerves ſend out at different diſtances round all the arterial Ramifications of the Subſtance of the Spleen, a great number of Filaments in form of an irregular Network.

346. The Arteries, Veins, and Nerves having entered the Spleen, are there divided and ſubdivided into a great number of Ramifications, and accompany each other to the very laſt Extremities of their Diviſions. They are contained in a kind of common cellular Capſula or Vagina, which firſt ſurrounds all the three, and then ſends off particular Septa between them. This Capſula ſeems to be formed by a Continuation of the cellular Subſtance of the Omentum and of that particular Lamina of the Coat of the Spleen which I mentioned above.

347. The capillary Extremities of all theſe vaſcular Ramifications both arterial and venal end in the filamentary Cells already mentioned. *Malpighi* conſidered them as diſtinct Capſulæ or Folliculi, containing the ſame number of ſmall Glands. They all communicate together, ſo that where-ever we pierce the Coat of the Spleen, we may through that Hole, inflate the whole Viſcus.

348. In Oxen and Sheep, there are no venal Ramifications, as I have ſaid. The Vena Splenica having entered the great Extremity of theſe Spleens, runs firſt of all for about half an Inch or an Inch, and afterwards inſtead of an ordinary Vein we find a Canal perforated on all ſides. The beginning of this Canal has ſtill ſome Remains of the Coats of a Vein; but the

Form of it is ſoon loſt, and then we find nothing but Sinuſes or Sulci in the reticular Subſtance in Oxen, and in the cellular Subſtance in Sheep.

349. The ſplenic Artery and Nerves are there ramified in a particular Vagina, as in Men; and the Extremities of theſe arterial Ramifications ſeem to ſwim or float in the Cells, and to fill their filamentary Subſtance with Blood. At the ends of ſeveral of theſe Capillaries, I have obſerved ſmall Corpuſcles diſpoſed like Bunches of Grapes; and I have ſeen two ſmall Tubes going out from each Corpuſcle, one long and open, the other ſmall and ſhort, which was loſt in the Sides of the Spleen.

350. I imagine that the long Tube, the Extremity of which I was not able to find, may be the Origin of a Lymphatic Veſſel, eſpecially becauſe theſe Veſſels are ſo very numerous and viſible in an Ox's Spleen, as has been already ſaid. Theſe ſmall Corpuſcles may eaſily be diſcovered in an Ox's Spleen, when boil'd by a particular Adminiſtration, of which I ſhall ſay more in another place. They are indeed much larger before than after boiling, but they are not ſo ſolid, and ſubſide more eaſily when cut. The ſame ſort of Corpuſcles may be diſcovered in the Human Spleen, but they are ſo extremely ſmall, as not to be viſible without a Microſcope.

351. The Uſes of the Spleen ſhall be explained after the Deſcription of the Omentum.

## §. 15. *Omentum & Appendices Epiploicæ.*

*Situation, Diviſion and Connexion of the Omentum.*

352. The Omentum is a large, thin, and fine membranous Bag, ſurrounded on all ſides by numerous Portions of Fat, which accompany and even inveſt the ſame number of Arteries and Veins adhering cloſely to each other.

353. The greateſt Part of it reſembles a kind of flat Purſe or a Sportſman's empty Pouch, and is ſpread more or leſs on all the ſmall Inteſtines from the Stomach to the lower part of the Regio Umbilicalis. Sometimes it goes down to the lower part of the Hypogaſtrium, and ſometimes does not reach beyond the Regio Epigaſtrica. It is commonly plaited or folded in ſeveral places, eſpecially between the Bands of Fat.

354. It is divided into a ſuperiour, and inferiour; an anteriour and poſteriour, and a right and left Portion. The ſuperiour Portion is in a manner divided into two Borders, one of which is fixed along the great Curvature or convex ſide of the Arch of the Colon, and the other along the great Curvature of the Stomach. The Commiſſure or Union of theſe two Borders on the right ſide, is fixed to the common Ligament or Adheſion of the Duodenum and Colon, and to the contiguous Parts of theſe two Inteſtines. That on the left ſide is fixed to the longitudinal Sciſſure of the Spleen, to the Extremity of the Pancreas, and to the convex ſide of the great Extremity of the Stomach. It is likewiſe fixed to the membranous Ligament which ſuſtains the Ductus Cholidochus, and connects it to the Vena Portæ Ventralis.

355. Below theſe Adheſions, the other Portions, that is, the anteriour, poſteriour, two lateral and inferiour Portions, which laſt is the Bottom of the Sacculus Epiploicus, have commonly no fixed Connexions, but lie

looſe between the Fore-ſide of the Cavity of the Abdomen and the Inteſtines. The anteriour and poſteriour Portions are generally called the Laminæ of the Omentum, but as that Term is ordinarily employed to expreſs the Duplicature of ſome compound Membrane, it would be more convenient to call them Folia, Alæ, or ſome ſuch Name.

*Structure of the Omentum.*

356. The Membrane of the Omentum is through its whole Extent, made up of two extremely thin Laminæ joined by a cellular Subſtance; the Quantity of which is very conſiderable along the Blood-Veſſels, which it every where accompanies in broad Bands, proportioned to the Branches and Ramifications of theſe Veſſels. Theſe cellular Bands are more or leſs filled with Fat according to the Corpulency of the Subject, and for that reaſon I have called them Bands or Portions of Fat.

*Little Omentum.*

357. Besides this large membranous Bag, which I name the great Omentum, there is another much ſmaller, which differs from the large one, not only in Size, but alſo in Figure, Situation and Connexion; and this I name the little Omentum. This ſmall Bag is fixed by its whole Circumference, partly to the ſmall Curvature of the Stomach, and partly to the concave ſide of the Liver before the Sinus of the Vena Portæ, ſo as to ſurround and contain the prominent Portion of the Lobulus.

358. The little Omentum is thinner and more tranſparent than the other, and its Cavity diminiſhes gradually from the Circumference to the Bottom, which in ſome Subjects terminates in ſeveral ſmall Cavities or Foſſulæ more or leſs pointed. Its Structure is pretty much the ſame with that of the great Omentum, it being compoſed of two Laminæ, with a Mixture of the ſame Portions of Fat, which are conſiderably finer than in the other.

359. We ſee from this Situation of the two Omenta, that in the Space left between the lower ſide of the Stomach and upper ſide of the Meſocolon, they have a very broad Communication with each other; ſo that if either of them contain'd in its Cavity, any Fluid, that Fluid might readily get between the Stomach and Meſocolon, and ſo paſs into the other Bag; eſpecially when the Stomach is empty, and conſequently its Situation eaſily changed.

360. Therefore by means of this Interſtice between the Stomach and Meſocolon, the two Omenta form one Cavity, which opens into the Cavity of the Abdomen by one common Orifice, ſituated near the Commiſſure on the right Side of the great Omentum. This Orifice is ſemilunar or ſemicircular, and formed by the Union of two membranous Ligaments, whereof one connects the beginning of the Duodenum and Neck of the Veſicula Fellis to the Liver; the other connects the contiguous Portion of the Colon to the ſame Viſcus, and extends to the Pancreas. From thence ariſes an incurvated Border, which ſurrounds the Root of the Lobulus, leaving an Opening wide enough to admit the end of the Finger.

361. To diſcover this Orifice of the Omentum, we need only raiſe a little the great Lobe of the Liver, and find out the Root of the Lobulus, and apply to it a large Pipe wrapt round with Cotton, Wool, or Tow, to hinder the Regreſs of the Air. Then if we blow gradually, the air will inflate the ſides of the great Omentum, and give it the appearance of a large

Bladder irregularly divided into ſeveral Lobes or Tubercles by the Bands of Fat, which appear in this State, like ſo many Fræna between the Lobes.

362. To be ſure of ſucceeding in this Experiment, the two Omenta muſt be in their natural State, and they muſt be handled very gently with the Fingers firſt dipt in Oil. It ſucceeds better in young, lean Subjects, than in old or fat Subjects.

363. When we touch theſe Membranes with dry Fingers, they ſtick to them ſo cloſely as hardly to be ſeparated without being torn, as we ſee by the reticular Holes which appear in thoſe Portions of the Membranes, that have been thus handled. In that caſe it is to no purpoſe, to blow through the natural Orifice already mentioned; and it is owing to theſe ſmall Holes that the Membranes of the Omentum have been ſuppoſed to be naturally reticular.

364. The membranous Laminæ of the little Omentum are continuous partly with the external Membrane of the Liver, partly with that of the Stomach, and a little with the Membrane that lines the neighbouring Portion of the Diaphragm. Thoſe of the great Omentum are continued partly with the ſame Coat of the Stomach, and partly with the external Covering of the Colon, and conſequently with the Meſocolon; and they likewiſe communicate with the Covering of the Spleen.

365. We may ſatisfy ourſelves concerning theſe Continuations, by making a ſmall Hole in one of the Laminæ of the Omentum near the Stomach, Colon, *&c.* and by blowing into that Hole, through a Pipe well fitted to it; for the Air will gradually inſinuate itſelf under the common Coats of theſe Viſcera: but if the Parts be dry, they muſt be moiſten'd a little, before the Experiment is made.

*Appendices Epiploicæ.*

366. The fatty Appendices of the Colon and Rectum have always appear'd to me to be a kind of ſmall Omenta or Appendices Epiploicæ. They are ſituated at different diſtances along theſe Inteſtines, being particular Elongations of their common or external Coat. They are of the ſame Structure with the great Omenta, and there is a cellular Subſtance contained in their Duplicature, more or leſs filled with Fat, according as the Subject is fat or lean.

367. Next the Inteſtine, each of them forms a broad, thin Baſis, and they terminate by irregular Papillæ, thicker than their Baſes. Theſe Baſes are at firſt diſpoſed longitudinally, then obliquely, and laſtly, more or leſs tranſverſely, eſpecially near the Rectum, and upon that Inteſtine.

368. These Appendices are for the moſt part ſeparated from each other; but ſome of theſe which have longitudinal Baſes communicate together, the Veſtiges of theſe Communications being very narrow, and not very prominent. By blowing through a ſmall Hole made in one of theſe Appendices, it is inflated like a ſmall irregular Bladder, and the Air paſſes under the external Coat of the Colon or Rectum.

369. Besides theſe Appendices Epiploicæ, we obſerve at different diſtances along the Colon, between the ligamentary Band which lies hid, and one of the other two, that is, on both ſides of the Adheſion of the Meſocolon,

ſeveral Adipoſe Strata, which may likewiſe be look'd upon as Appendices of the ſame Nature with the former; but theſe Strata are very ſeldom obſerved between the two apparent ligamentary Bands of the Colon.

*Veſſels of the Omentum.*

370. The Arteries and Veins of the great Omentum are Branches of the Gaſtricæ, and for that reaſon, go by the Name of Gaſtro-Epiploicæ, Dextræ and Siniſtræ. The Arteries on the right ſide anſwer to the Hepatic Artery, and thoſe on the left ſide to the Splenic, and both communicate with the Arteria Ventriculi Coronaria, and reſpectively with the Arteriæ Meſentericæ. The Gaſtro-Epiploic Veins anſwer in the ſame manner of Diſtribution, to the Vena Portæ.

371. The Veſſels of the little Omentum come chiefly from the Coronariæ Ventriculi, and thoſe of the Appendices and Strata are Ramifications from the reticular Texture of the Arteries and Veins of the Colon and Rectum.

## §. 16. *Uſes of the Abdominal Viſcera deſcribed in the thirteen foregoing Paragraphs.*

372. The Inteſtines in general finiſh what the Stomach had begun. The alimentary Pulp having been ſufficiently prepared by the Succus Gaſtricus, or Lymph of the Stomach, undergoes a farther Change by the inteſtinal Lymph, Bile and Pancreatic Juice, by which the milky Liquor called Chyle is produced, and this Liquor rendered fluid enough to enter the lacteal Veſſels through the Tunica Villoſa of the ſmall Inteſtines, while the groſſer Portion of the Aliment continues its Courſe, and becoming gradually thicker as it advances toward the great Inteſtines, is there collected by the Name of Feces.

373. The Dilatation of the Inteſtines is bounded by their common Coat. The undulating, ſucceſſive and periodical Contraction of the fleſhy Fibres, eſpecially of the orbicular Fibres of the muſcular Coat, expreſſes the inteſtinal Lymph, beats it up into an Emulſion with the alimentary Paſte, ſtrains that Emulſion through the lacteal Veſſels, and propels the Reſiduum in the manner already ſaid.

374. The nervous Coat ſerves to ſuſtain the Tunica Villoſa, and by the oblique Diſpoſition of its Fibres, yields to the Periodical Motions of the muſcular Coat, without compreſſing the Chyliferous Ducts which paſs through the Meſhes of this Coat in the ſmall Inteſtines. The Uſes of the villous or internal Coat are ſufficiently apparent from the Deſcription given of it.

375. The Length of the ſmall Inteſtines gives a great Extent to what may be call'd the Strainer of the Chyle, and this Extent is very much inlarged by the numerous Folds termed Valvulæ Conniventes. By means of this large Extent, there is a great quantity of Chyle ſtrained through theſe Inteſtines, and the Valves hinder the alimentary Pulp from paſſing through them too faſt, that is, before all the milky Juice has been expreſſed; and

this may be obſerved chiefly in the beginning of the Inteſtines, where theſe Valves are moſt numerous and broadeſt, and the Aliment moſt fluid.

376. The Cavity of the great Inteſtines ſerves to receive the Feces of the Aliment, and to contain a conſiderable Quantity thereof for a certain Space of Time, without any inconveniency, and without being obliged to diſcharge them continually, which would be as great an inconveniency as any. The Incurvation of the Colon, its Cells and Contraction of its laſt Convolutions contribute to this retention of the Feces; but the Cæcum ſeems to be the firſt Organ thereof, becauſe the Feces being firſt collected there, are obliged afterwards to move in a contrary Direction as they aſcend into the Colon.

377. The Valve of the Colon, which might more properly be termed the Sphincter or Pylorus of the Ileum, hinders the Feces from returning into the ſmall Inteſtines: I ſay, the Feces or groſs Matter, becauſe it is not certain that this Valve intirely ſtops that Paſſage, or that it always hinders any fluid Matter forced downward by the Colon from entering the Ileum, even in a natural State.

378. The Glandular Lacunæ of the great Inteſtines furniſh continually a kind of Mucilage, which not only defends the internal Coat from the Acrimony of the Feces, but ſerves alſo to lubricate theſe Feces in proportion to their different degrees of Solidity.

379. The Appendicula Vermiformis is ſo very ſmall in Adults, that its Uſe cannot be determined with certainty. Perhaps the mucilaginous Matter in its Cavity, furniſhed by the numerous Glandular Lacunæ of its internal Coat, which can only be evacuated by Plenitude, may, during its ſtay there, contract an Acrimony, which may vellicate or ſtimulate the Cæcum, in order to throw its contents into the Colon.

380. The Inteſtinum Rectum is the laſt Reſervatory of the Feces. The great Thickneſs of its muſcular Coat, and the great Number of longitudinal Fibres by which this Thickneſs is chiefly formed, enable it to yield to the collected Feces to ſo great a degree, as to repreſent a large Bladder or Stomach. The Muſculi Levatores Ani ſerve to ſuſpend the lower Portion of this Inteſtine, eſpecially when full; and it is partly by the Contraction of theſe Muſcles which overcome the Sphincter of the Anus, that the Feces are diſcharged out of the Body. Theſe Sphincters form the third Pylorus of the whole alimentary Canal.

381. The Meſentery and Meſocolon connect the Inteſtines, in ſuch a manner, as that they cannot be twiſted or run into Knots, without hindering them from ſliding and yielding to each other according to the different Poſtures of the Body, or according as they are more or leſs empty or full.

382. The Adheſions of the Meſentery form the Convolutions of all the ſmall Inteſtines into a large Bundle, irregularly round, which fills a great part of the Cavity of the Abdomen, from the Epigaſtrium downward.

383. The Meſocolon by its adheſion to the Colon forms a kind of Septum Tranſverſum, between the ſmall Inteſtines and the Viſcera contained in the Epigaſtrium; and this Septum ſupports the Liver and Stomach under

the Arch of the Diaphragm, juſt as much as it is ſuſtained by the Inteſtines. This natural Situation of theſe Viſcera is moſt commonly altered in dead Bodies opened after the common Method, and without the neceſſary Precautions.

384. The breadth of the Meſentery and Meſocolon affords a large extent to the Ramifications of the Arteries, Veins and Nerves diſtributed through them by innumerable Communications and Anaſtomoſes, by means of which any Portion of the Inteſtines may be ſupplied, though the principal Branch which leads to it ſhould happen to be compreſſed or obſtructed.

385. The cellular Subſtance in the Duplicature of the Meſentery and Meſocolon, ſerves not only for a ſoft Bed to all theſe Ramifications, but alſo to contain thoſe Collections of Fat, neceſſary for the formation of the Bile, as I ſhall obſerve hereafter; and the cellular Subſtance of the Meſentery has likewiſe one Uſe peculiar to it, which is to inveſt the Lymphatic Glands and Lacteal Veſſels, and upon this account it is thicker than that of the Meſocolon.

386. The Lacteal Veſſels being firſt formed by a copious reticular Texture round the Circumference of the Inteſtines, reſembling the vaſcular Net-work of that Canal, and afterwards uniting every where through the Duplicature of the Meſentery, with the arterial Ramifications which they likewiſe accompany in many places; it is eaſy to conceive that the Pulſation of the Meſenteric arteries muſt propel the Chyle in the Lacteal Veſſels from the Inteſtines to the Receptaculum Chyli, that Motion being ſuitable to the Direction of their Valves.

387. The Liver is the principal Organ for the Secretion of the Bile. The Villi of that immenſe number of Glandular Cells of which it is compoſed, filtrate continually from the Blood of the Vena Portæ, ſmall Drops of Bile which afterwards inſinuate themſelves into the Pori Bilarii, and are in part lodged in the Veſicula Fellis, and in part run directly into the Duodenum, in the manner already explained in deſcribing the Biliary Ducts.

388. The Spleen, Omentum, Appendices Epiploicæ, Adipoſe Strata of the Meſentery, and thoſe of the great Inteſtines, and even the Pancreas, with the whole Series of Glands in the inteſtinal Canal, ſeem to contribute to the Formation of the Bile, as ſo many auxiliary or rather preparatory Organs; but each of them in a different way.

389. It appears, (1.) That the Venal Blood that returns from all the Inteſtinal Glands, and from the Pancreas, has left a great Portion of its Serum. (2.) That the Blood which returns from the Spleen has undergone a certain Change, by its Courſe being mechanically retarded, and likewiſe that its Texture is altered by the Action of the numerous nerves ſent thither by the Plexus Splenicus. (3.) That the Blood which returns from the Omenta, Appendices Epiploicæ, and from the Strata and other Collections of Fat, is loaded with Oil.

390. These three kinds of Venal Blood meet in the Trunk of the Vena Portæ Ventralis, where they are mixed together, and from thence they enter the tranſverſe Sinus or Trunk of the Vena Portæ Hepatica. In this Sinus they are ſtill more intimately mixed, as in a kind of Lake, and become

come one uniform Maſs of Blood, which being forced into the Branches of the Vena Portæ Hepatica, only by the ſupervening Blood, from the other Vena Portæ, and by the lateral Pulſations of the Ramifications of the Hepatic Artery, its Courſe muſt be very ſlow. The Secretion of the Bile depends partly on this ſlow Motion, and partly on theſe external Impulſes, as I ſhall ſhow in another place.

391. The veſicular Bile appears to be more exalted than that in the Hepatic Duct; and by meeting in the Ductus Cholidochus, they ſeem to compoſe a third kind of Bile, which without the Cyſtic or Veſicular Bile would perhaps be too mild; and too acrid without the Hepatic. This Bile mixes in the Duodenum with the Pancreatic Juice, and with that of the inteſtinal Glands, and from this Mixture a Fluid reſults, which is proper to ſeparate the Chylous Matter from the groſs and uſeleſs Part of the alimentary Pulp, as it comes from the Stomach.

## §. 17. *Renes & Ureteres.*

*Situation, Figure, and Diviſion of the Kidneys.*

392. The Kidneys are two pretty ſolid, glandular Bodies, ſituated in the poſteriour Part of the Cavity of the Abdomen, on each ſide of the Lumbar Vertebræ, between the laſt falſe Ribs, and Oſſa Ilium. The right Kidney lies under the great Lobe of the Liver, and is conſequently lower than the left, which lies under the Spleen.

393. The Figure of the Kidneys reſembles that of a large Bean, their Circumference being convex on one ſide, and concave on the other. The concave Side is turned to the Vertebræ, and the convex Side, the oppoſite way. Their Length anſwers to the Diſtance between the laſt falſe Rib, and Os Ilium; they are about half as broad as long, and half as thick as broad.

394. In each Kidney we obſerve a fore and back ſide; an upper and lower Extremity; a great and ſmall Curvature, and a Convexity and Concavity.

395. The back-ſide is broader than the fore-ſide; and the upper Extremity is a little broader and more incurvated than the lower. The Depreſſion in the ſmall Curvature is oblong and uneven, reſembling a Sinus, ſurrounded by ſeveral Tubercles; and as it is turned a little toward the foreſide, this ſide is ſomething narrower than the other.

*Blood-Veſſels of the Kidneys.*

396. The deſcending Aorta and inferiour Vena Cava lie between the Kidneys, pretty cloſe to the Bodies of the Vertebræ, and to each other; the Artery being on the left hand, the Vein on the right. Each of theſe large Veſſels ſends out tranſverſely toward each ſide, commonly one capital Branch, which goes to the Kidney, and enters the Sinus or Depreſſion thereof, by ſeveral Rami, of which hereafter.

397. These Veſſels were by the Ancients termed the emulgent Arteries and Veins, but I chuſe rather to call them Arteriæ Venæ Renales. Sometimes there are more than one of each kind, which is ofteneſt found in the Arteries, ſometimes on one ſide only, and ſometimes in both.

398. The Artery and Vein are not of an equal Length, and the difference depends on the Situation of the Aorta and Vena Cava; for the left Renal Artery is ſhorter than the right, becauſe the Aorta lies neareſt the left Kidney; and the left Renal Vein is longer than the right, becauſe the Vena Cava lies furtheſt from the left Kidney.

399. These Veſſels are likewiſe diſpoſed in ſuch a manner, as that the Veins lie more anteriourly than the Arteries; becauſe the Aorta lies cloſe to the Spina Dorſi; whereas the Vena Cava which perforates the Diaphragm at ſome diſtance from the Vertebræ, does not join them, till after it has given off the Renal Veins.

*Nerves of the Kidneys.*

400. Each Renal Artery is ſurrounded by a nervous Net-work, called Plexis Renalis, which furniſhes a great number of Filaments to the Kidneys, that come partly from the Semilunar Ganglions of the two great Sympathetic Nerves, and partly from the Plexus Hepaticus and Splenicus. This Renal Plexus ſends likewiſe ſome Filaments round the Renal Veins.

*Coats of the Kidneys.*

401. The Kidneys are ſurrounded by a very looſe membranous and cellular Covering, called Membrana Adipoſa, becauſe in fat Perſons the Cells of this Subſtance are filled with Fat. This was for a long time impertinently taken for a Duplicature of the Peritonæum, the true membranous Lamina of which, covers only the foreſide of the Kidneys; and conſequently they lie without the Peritonæum, becauſe the Portion of that Membrane that covers them cannot be looked upon as an intire Coat; ſo that the only common Coat they have, is the cellular Subſtance which likewiſe inveſts the Renal Arteries and Veins in form of a Vagina.

402. The proper Coat or Membrane of the Kidneys is compoſed of two Laminæ, between which there is likewiſe a very fine cellular Subſtance, which may be made ſenſible by blowing through a Pipe between the two Laminæ.

403. The external Lamina is very thin, and adheres cloſely to the internal Lamina, by means of the cellular Subſtance. The internal Lamina penetrates every where by numerous Elongations, into the Subſtance of the Kidney, from which it cannot be ſeparated without tearing.

404. The Surface of the external Lamina is very ſmooth, poliſhed and gliſtening, and it renders the whole Surface of the Kidney very even and uniform in Adults. In Children, this convex Surface is in a manner divided into ſeveral Lobes or Tubercles, almoſt as in Oxen and Calves; and in grown Perſons we ſometimes obſerve the ſame Inequalities.

405. The Blood-Veſſels having entered the Kidneys, are ramified every way, and theſe Ramifications ſend out other capillary Rami, which go all the way to the Surface, where they appear like irregular Stars, and furniſh the proper Membrane of the Kidneys. Sometimes theſe two Ramifications penetrate to the Membrana Adipoſa, and communicate there with the Arteriæ and Venæ Adipoſæ.

406. The proper Membrane having ſurrounded the Kidney, all the way to the Sinus, joins the Veſſels at that Place, and accompanies all their Ramifications through the Body of the Kidney, in form of a Vagina or Capſula,

ſula, and likewiſe contributes in part to form the Pelvis and Calices or Infundibula, of which hereafter.

407. We ſometimes obſerve a conſiderable Veſſel to go in or come out from the convex Surface of the Kidney, but this is not common; and in that caſe there is a Depreſſion by which the proper Membrane enters, and communicates with that Portion which goes in by the Sinus.

408. The Tunica Adipoſa or common Coat, which likewiſe inveſts the great Veſſels to their entry into the Kidneys, does not ſeem to accompany them any further; but terminates at the Sinus, in the Interſtices between the Ramifications.

*Structure of the Kidneys.*

409. We may diſtinguiſh three kinds of Subſtances in the Kidney; an exteriour Subſtance, which is thick, granulated, and in a manner Cortical; a middle Subſtance, which is medullary and radiated, called Striata, Sulcata or Tubularis, becauſe it ſeems to be made up of radiated Tubes; and an inner Subſtance, which is only a Continuation of the Second, and terminates on the inſide by Papillæ; for which reaſon I have given it the name of Papillaris.

410. These three Subſtances may be ſeen diſtinctly in a Kidney cut into two equal Parts, through the great Curvature. The Cortical Subſtance may be obſerved round the whole Circumference; and by the Microſcope, we perceive it to be of a ſpungy, granulated, and waving Texture, all its Parts adhering together in a radiated manner. Its Colour is a bright whitiſh Grey.

411. By fine anatomical Injections and in Inflammations, we diſcover an infinity of ſmall Capillary Veſſels, which run in various Directions, between and round the different Portions of this Subſtance, and by the help of a Microſcope, we ſee likewiſe great numbers of ſmall red Corpuſcles more or leſs round, and diſpoſed almoſt like Bunches of Currants. Theſe ſmall Corpuſcles are perhaps only the Extremities of the cut Veſſels, filled either with Blood or with a coloured Injection.

412. The other two Subſtances, that is, the Medullary or Striated and Papillary, are really but one and the ſame Maſs, of a more reddiſh colour, the convex ſide of which riſes at ſeveral places into narrow Tubercles, lodged in the ſame number of Cavities or Depreſſions. The radiated Striæ are afterwards continued to the Papillary Portion; and the Papillæ form in ſome meaſure ſo many Centers of theſe Radii, oppoſite to the Tubercles.

413. The medullary Subſtance is likewiſe diſtinguiſhed from the Cortical, by the arterial and venal Arches, which ſend Capillary Ramifications on all hands; and its Colour is more or leſs red.

414. The Papillæ, which are only a Continuation of the medullary Subſtance, as has been ſaid, are often a little paler than that Subſtance. They are ten or twelve in number, very diſtinct from each other, reſembling the ſame number of Cones, with very broad Baſes and obtuſe Apices.

415. At the Point of each Papilla we ſee, even without a Microſcope, in a ſmall Depreſſion, ſeveral very ſmall Holes, through which little Drops may be perceived to run when the Papillæ are compreſſed. Theſe are little Drops of Urine, which being filtred, partly in the cortical, partly in the medullary or tubular Subſtance, do afterwards paſs through the Subſtance of the Papillæ, and are diſcharged by theſe Orifices.

*The Pelvis of the Kidneys.*

416. Each Papilla lies in a kind of membranous Calix or Infundibulum, which opens into a common Cavity, called the Pelvis. This Pelvis is membranous, being of the ſame Structure with the Calices, of which it is a Continuation; and its Cavity in Man is not uniform, but diſtinguiſhed into three Portions, each of which contains a certain number of Infundibula or Calices, together with the Papillæ which lie therein: and ſometimes we find two or three Papillæ in the ſame Infundibulum.

417. At the place where theſe Infundibula ſurround the Baſes of the Papillæ, they ſend Productions into the medullary or radiated Subſtance of the Kidney, which accompany the Blood-Veſſels, and ſerve for Capſulæ or Vaginæ to all the vaſcular Arches, both Arterial and Venal, and to their different Ramifications, quite through the Cortical Subſtance, and as far as the Surface of the Kidney.

*Ureters.*

418. After the Infundibula have contracted in a conical Form round the Apices of the Papillæ, each of them forms a ſmall ſhort Tube or Gullet, which uniting at different diſtances along the bottom of the Sinus of the Kidney, form three large Tubes which go out from the Sinus, in an oblique Direction from above downwards, and immediately afterwards unite into one Trunk.

419. This Trunk becomes a very long Canal, called the Ureter. In Men, the three Tubes ſupply the place of what is called the Pelvis in Brutes, and might more properly be called the Roots or Branches of the Ureters than the Pelvis; which name would agree beſt to the Trunk, as being larger than the reſt of the Ureter. The Ureters are commonly two in Number, one for each Kidney, but ſometimes there are more than two.

420. The Situation of the Trunk, and of the Roots and Branches of each Ureter, with reſpect to the renal Artery and Vein, is in the following manner: The Artery is in the upper part of the Sinus, and partly before the Vein. The Vein is about the middle, and between the Artery and Ureter. The Ureter is in the lower part, a little behind the Vein, and it is partly ſurrounded by one Branch of the Artery.

421. This Diſpoſition appears plainer near the anteriour than near the poſteriour ſide of the Kidney, becauſe this laſt is broader than the former; and we likewiſe ſee there the three Branches of the Ureter, of which the uppermoſt is the longeſt, and the loweſt is the ſhorteſt, becauſe of their oblique Direction downward.

422. From this Deſcription, we ſee that in the Human Kidney there is no other common or uniform Pelvis, but the Trunk or Head of the Ureter, and the three great Branches. To have a true Idea of their Diſpoſition, we

muſt imagine that the Ureter enters the Kidney by the lower part of the oblong Sinus; that it encreaſes gradually in breadth as it advances, and that it is divided into three Branches, before it enters the ſubſtance of the Kidney.

423. One of theſe Branches may be reckoned a direct Continuation of the Ureter, and it is longer than the reſt; being extended from the lower to the upper part of the Sinus, and it may be found without much preparation. The other two Branches are ſhorter, and cannot be well diſcovered without an artificial Separation. The Angles between theſe branches at their Baſes, or at the head of the Ureter, are not pointed as thoſe of other Ramifications, but formed by a round Incurvation, which is generally ſurrounded by Fat.

424. These firſt Branches of the Ureters produce other ſmall Branches at the bottom of the Sinus, which are diſpoſed in Pairs. Theſe ſmall collateral Branches extend in breadth, and form the Infundibula or Calices, in which the Papillæ are lodged; the great Circumference of which, produces in the Subſtance of the Kidney, the different Vaginæ of the vaſcular Arches and of their Ramifications. The internal Lamina of the Kidney is continued round theſe Vaginæ, and the external Lamina is expanded round the firſt Branches, round the Trunk, and round all the reſt of the Ureter.

425. If the Trunk of the Ureter be ſplit on that Side which is next the Vertebræ, and this Section be continued to the Extremity of the ſuperiour Branch, we may obſerve immediately above the Trunk, two Holes lying near each other, which are the Orifices of the ſmall collateral Branches, and Gullets of the Infundibula. A little above theſe Holes, there are other two very much like them, and ſo on all the way to the Extremity of the ſuperiour Branch, which terminates likewiſe by theſe Gullets of the Infundibula; and in each of theſe Gullets we may obſerve at leaſt the Apex of one Papilla.

426. A Section begun on the convex Surface of the Kidney, and carried from thence to the Trunk of the Ureter, diſcovers the Extent of the Papillæ very plainly, and likewiſe the Infundibula, their Gullets, *&c.* but it will be difficult to give Beginners a juſt Idea of the Structure of theſe Parts, without the other Section.

427. The Ureters run down obliquely, and with a very ſmall degree of Inflection, from the Kidneys to the lateral Parts of the inner or anteriour ſide of the Os Sacrum, and paſſing between the Rectum and Bladder they terminate in the laſt of theſe Viſcera in the manner that ſhall be explained hereafter.

428. They are compoſed of three proper Coats; the firſt of which, that ſurrounds the reſt, is of a whitiſh Colour, and of a very compact filamentary Texture, being ſtretched with difficulty, and appearing like a filamentary Subſtance degenerated. The next Coat is of a reddiſh Colour, ſtronger than the firſt, and made up of different Strata of Fibres, which interſect each other; but it is very hard to determine, whether they are muſcular or ſimply membranous.

429.

429. The innermoſt Coat is in ſome meaſure ligamentaty, and lined by a very fine Membrane, which covers a very delicate reticular Texture of Veſſels. It is ſlightly granulated like ſhorn Velvet; and moiſtened all over by a mucilaginous Liquor. It has ſeveral longitudinal Rugæ, which are interſected by a great number of ſmall tranſverſe Rugæ.

430. Besides theſe proper Coats, the Ureters are inveſted by the cellular Subſtance of the Peritonæum; the membranous Lamina of which, covers likewiſe about two thirds of their Circumference, ſometimes more, ſometimes leſs, but never ſurrounds them entirely: ſo that when they are examined in their natural Situation, they appear like Ropes lying behind the Peritonæum, and jutting out more or leſs toward the Cavity of the Abdomen, together with that Portion of the Peritonæum, which covers them.

431. All that has been ſaid about the Structure of the Ureters Pelvis, Arches, Striæ, Foſſulæ, and Holes at the Apex of the Papillæ, appears moſt diſtinctly, when theſe Parts are examined in clear Water, as I have already often obſerved.

## §. 18. *Glandulæ Renales, vulgò Capſulæ Atrabilariæ.*

*Situation, Figure, and Size of the Renal Glands.*

432. Immediately above each Kidney, lies a glandular Body, called by the Ancients Capſulæ Atrabilariæ; by others Capſulæ Renales, Renes Succenturiati, and Glandulæ Renales; and they might be properly enough termed Glandulæ Supra-Renales. They are ſituated on the upper Extremity of each Kidney a little obliquely, that is, more toward the inner edge and Sinus of the Kidney than toward the outer convex Edge.

433. Each Gland is an oblong Body with three Sides, three Edges and two Points, like an irregular Creſcent with its great or convex edge, ſharp, and the ſmall concave Edge, broad. Its length is about two thirds of the greateſt breadth of the Kidney, and the breadth of its middle Portion is about one third of its Extent between the two Extremities, ſometimes more, ſometimes leſs. Its Colour is a dark Yellow.

434. It has one anteriour, one poſteriour, and one lower ſide, which laſt may be termed the Baſis; and it has one upper, and two lower Edges, whereof one is anteriour, the other poſteriour. The upper Edge may be called the Criſta, and the two lower Edges, the Labia. One of its Extremities is internal, or turned inward toward the Sinus of the Kidney; the other is external, or turned outward toward the gibbous part of the Kidney. The Figure of this glandular Body may likewiſe be compared to that of a ſingle Cock's-Comb, or to the Top of an Helmet.

*Structure of the Renal Glands.*

435. The Surface of theſe Glands is uneven; the foreſide is the broadeſt and the lower ſide or Baſis the narroweſt. Along the middle of the anteriour ſide, a Ridge runs from the Edge of the inner Extremity a little above the Baſis, to the Point of the other Extremity, and divides this ſide into two equal Parts, like the middle rib of the Leaf of a Tree, and on the lower ſide under the Baſis, there is a kind of Raphe or Suture.

436.

436. The Blood-Veſſels of theſe Glands, come from the Arteriæ, and Venæ Renales, and Diaphragmaticæ, and likewiſe from the Aorta and Vena Cava, from the Arteria Cæliaca, *&c.* Theſe Veſſels are termed the Capſular Arteries and Veins, and as they enter the Glands, they ſeem to be inveſted by a Vagina. They are not always derived from the ſame Sources, neither is their number the ſame in all Subjects; and there is commonly a pretty large Vein, which runs along the Ridge. The Nerves on each ſide, are furniſhed by the neighbouring Semilunar Ganglion, and by the Renal Plexus which depends on it.

437. In the inſide of theſe Capſulæ, there is a narrow triangular Cavity, the Surface of which is full of ſhort, ſtrong Villi of a yellowiſh Colour; but in Children it is reddiſh, and of a dark brown in aged People. The ſides of this Cavity are connected by a great number of Filaments; and they appear to be wholly glandular, that is, to be filled with very fine ſmall Folliculous Corpuſcles. Along the top of the Gland, theſe ſides touch each other immediately.

438. In opening this Cavity, we find a granulated or follicular Subſtance, which fills it almoſt intirely; and the Blood-Veſſels are diſtributed on this Subſtance, as well as on the ſides of the Cavity. If the Section be begun at the great Extremity of the Capſula, and be continued through the upper Edge; and if the lateral Portions be afterwards ſeparated, the glandular Body appears like a kind of Criſta, raiſed from the middle of the Bottom of the Cavity.

439. This glandular Body or Nucleus, adheres more cloſely to the Bottom or Baſis of the Cavity, than to the two ſides, eſpecially near the great Extremity; but yet it may be ſeparated, both from the Baſis and ſides, being connected to them by a great number of ſmall Filaments. It adheres leaſt to the Baſis near the ſmall Extremity.

440. The Capſular Vein, which comes ordinarily from the Vena Renalis, is much larger than the Arteries; and it communicates with the inſide of the Capſula, much in the ſame manner as the Vena Splenica, with the Cells of the Spleen, for it may be inflated by blowing into any part of the capſular Cavity, and the Air likewiſe paſſes into the Vena Renalis, *&c.*

441. This Cavity contains an unctuous viſcid Liquor, of a yellowiſh red Colour, which with Age, changes gradually into a yellowiſh Purple, a dark Yellow, and a black Yellow; and ſometimes it is perfectly black, but even then if it be ſpread thin on a large Surface, it appears yellow. I have ſometimes found it not only reddiſh, but mixed with real Blood.

442. The Uſes of theſe Renal Glands have not as yet been diſcovered; and all that we know about the Liquor contained in them, is, that it reſembles the Bile. They are very large in the Fœtus, and diminiſh in Adults. Theſe two Phænomena deſerve our Attention.

443. They lie ſometimes directly on the top of the Kidneys, but I never found them on the gibbous part. The Gland on the right ſide is partly connected to the Diaphragm, under and very near the Adheſion of the great Lobe of the Liver to that Muſcle. That on the left ſide adheres to the

Diaphragm below the Spleen; and both theſe Connexions are confined to the contiguous Portions of the inferiour Muſcle of the Diaphragm. They are involved together with the Kidneys, in the Membrana Adipoſa, of which a very thin Portion inſinuates it ſelf between the Kidneys and Glands, and alſo between them and the Diaphragm; ſo that they adhere to both by the Intervention of the cellular Subſtance, which in ſome Subjects contains a Stratum of Fat.

444. The venal Ridge already mention'd, ſinks ſo deep into the foreſide in ſome Subjects, that the upper part of this ſide appears to be ſeparated from the lower; but this is ſeen moſt diſtinctly when the Capſula is examined in clear Water.

445. When the capſular Vein is opened lengthwiſe with the Point of a Lancet, we diſcover in it a great many ſmall Holes, many of which are only the Orifices of the Rami of the Vein, others are ſimple Holes; and it is perhaps through theſe that the Air paſſes into the Gland, as already mentioned.

446. On the outer Surface of theſe Capſula, we obſerve a very thin, diſtinct Coat, ſeparate from the cellular Subſtance that ſurrounds them. Some times this Coat is raiſed by an uneven Stratum of Fat, which makes it appear granulated; and for the ſame reaſon, the Capſulæ are of a pale colour like a Corpus Adipoſum.

447. The Liquor contained in them appears ſometimes in the Fœtus, and in young Children, of a bluiſh Colour inclined to red.

448. To be able to diſcover the Uſes of theſe Capſulæ, we muſt not only attend to the two Circumſtances already mentioned, but alſo their external Conformation, which is commonly more regular in the Fœtus, and in Children, than in Adults and old People. We muſt likewiſe conſider the Conſiſtence and Solidity of their Subſtance, which is greater before Birth, and in Childhood, than in an advanced or old Age; in which they are often very flaccid, and very much decay'd: and this perhaps may be the reaſon, why the Figures given of theſe Glands taken out of their Membrana Adipoſa, are ſo very irregular and different from what I have demonſtrated for above twenty Years paſt.

## §. 19. *Veſica Urinaria.*

*Situation, Figure, and Diviſion of the Bladder.*

449. The Bladder is a kind of membranous and fleſhy Pouch or Bottle, capable of Dilatation and Contraction, ſituated in the lower part of the Abdomen, immediately behind the Symphyſis of the Oſſa Pubis, and oppoſite to the beginning of the Inteſtinum Rectum. The Figure of it, is nearly that of a ſhort Oval. It is broader on the fore and back ſides, than on the lateral Parts; rounder above than below, when empty, and broader below than above, when full.

450. It is divided into the Body, Neck and Bottom; into an anteriour, poſteriour, and two lateral Parts. The upper Part is termed the Fundus or

Bottom, and the Neck is a Portion of the lower Part, which is contracted like the Gullet of ſome Veſſels.

*Structure of the Bladder.* 451. The Bladder is made up of ſeveral Coats, almoſt like the Stomach. That Part of the external Coat which covers the upper, poſteriour and lateral ſides of the Bladder, is the true Lamina or Membrane of the Peritonæum; and the reſt of it is ſurrounded by a cellular Subſtance, by the intervention of which, the Peritonæum is connected to the muſcular Coat.

452. The proper Coats are three in number, one muſcular, one nervous, and one villous, which is the innermoſt. The muſcular Coat is compoſed of ſeveral Strata of fleſhy Fibres; the outermoſt of which, are moſtly longitudinal; the next to theſe are more inclined toward each Hand; and the innermoſt, more and more oblique, and they become at length almoſt tranſverſe. All theſe Fibres interſect each other in various manners, and they are connected together by a fine cellular Subſtance, and may be ſeparated by inflating that Subſtance.

453. The nervous Coat is nearly of the ſame Structure with the Tunica Nervoſa of the Stomach.

454. The internal Coat is ſomething granulated and glandular, and a mucilaginous Serum is continually diſcharged through it, which moiſtens the inner Surface of the Bladder, and defends it againſt the Acrimony of the Urine. It appears ſometimes altogether uneven on the inner ſide, being full of Eminences and irregular Rugæ when empty, and in its natural State of Contraction. Theſe Inequalities diſappear when the Bladder is full, or when it is artificially diſtended by Air, or by injecting any Liquid.

*Urachus.* 455. At the top of the Bladder above the Symphyſis of the Oſſa Pubis, we obſerve a ligamentary Rope, which runs up between the Peritonæum and the Linea Alba of the Abdomen, all the way to the Navel, diminiſhing gradually in thickneſs, as it aſcends. This Rope had a particular uſe in the Fœtus, as ſhall be ſaid in another Place. Is is ſufficient to add here, that it is in part originally a Production of the inner Coats of the Bladder, which Production is termed Urachus.

*Arteriæ Umbilicales.* 456. This Rope is compoſed likewiſe of two other ligamentary Elongations, which are the Extremities of the umbilical Arteries. Theſe Arteries come from the Hypogaſtricæ, run up by the ſides of the Bladder, and remain hollow and filled with blood, even in Adults, as high as the middle of the Bladder, through all which Space they likewiſe ſend off Ramifications. Afterwards they loſe their Cavity, and become ligamentary as they aſcend. At the upper part of the Bladder, they approach each other, and joining the Urachus, form that Rope, which may be termed the ſuperiour Ligament of the Bladder.

457. The external Fibres of the muſcular Coat, are more numerous than the internal; and the moſt longitudinal anteriour Fibres, form a kind of Incurvation round the Urachus at the top of the Bladder, much like that of one of the fleſhy Portions, which ſurround the ſuperiour Orifice of the Stomach, and lower Extremity of the Œſophagus. This Incurvation paſſes behind the Urachus.

458. The Portion of the Peritonæum, which covers the poſteriour convex ſide of the Bladder, forms a very prominent, tranſverſe Fold, when the Bladder is contracted, which diſappears when the Bladder is extended. This Fold ſurrounds the poſteriour half of the Bladder, and its two Extremities are elongated toward each ſide; by which Elongations a kind of lateral Ligaments of the Body of the Bladder is formed, which are more conſiderable in Children, than in Adults.

459. The lower part of the Bladder, which deſerves the name of Fundus much better than the upper Part, is perforated by three Openings, one anteriour, and two poſteriour. The anteriour Opening is formed by an Elongation of all the proper Coats, in form of a Gullet, turned much in the ſame manner with the inner Orifice of the Roſtrum of the Head of an Alembic. This Elongation is called the Neck of the Bladder, the Deſcription of which belongs to that of the Parts of Generation in Men.

460. The other two Openings in the true Fundus of the Bladder, are formed by the Ureters, which in their Courſe downward already deſcribed, run behind the ſpermatic Veſſels, and then behind the lower part of the Bladder, approaching each other. Each Ureter lies between the umbilical Artery, and Vas Deferens of the ſame ſide; the Artery lying on the outſide of the Ureter, and the Vas Deferens on the inſide.

461. Afterwards they get between the Vaſa Deferentia and the Bladder, croſſing theſe Canals; and then at about a Finger's breadth from each other, they begin to pierce the Coats of the Bladder. They run a little way between the muſcular and nervous Coats, and open into the Bladder obliquely, ſomething nearer each other, than when they firſt entered its Coats.

462. The Orifices of the Ureters in the Bladder are ſomething oval and narrower than the Cavity of the Ureters immediately above them. The Edge of theſe Orifices is very thin, and ſeems to be formed merely by the Union of the internal Coat of the Bladder, with that of the Ureters.

*Blood-Veſſels and Nerves of the Bladder.*

463. The Arteries of the Bladder are furniſhed by the Hypogaſtricæ or Iliacæ internæ; being Rami of the Arteria Sciatica, Epigaſtrica and Umbilicalis on each ſide. The Veins come from thoſe of the ſame Names with the Arteries.

464. The Nerves of the Bladder come from the Crurales, and alſo from the Symphathetici Maximi, by means of their Communication with the Crurales. It has likewiſe ſome Nerves from the Plexus Meſentericus inferior.

465. Bsides the Ligaments already mentioned, there are likewiſe two ſmall ones, by which the anteriour part of the true Fundus of the Bladder is connected to the Oſſa Pubis, which ſhall be deſcribed with the Neck and Sphincter, after the Hiſtory of the Parts of Generation in both Sexes; and I refer to the ſame place, all that relates to the Connexion of the Bladder with the other neighbouring Parts.

## §. 20. *The Parts of Generation in Males.*

*Situation in general, and Diviſion of theſe Parts.*

466. The Parts of Generation in Males are of different kinds, ſome of them being wholly contained in the Abdomen, and others lying without it. From this Situation, they might properly enough be divided into external and internal Parts; and all thoſe belonging to the firſt Claſs might be deſcribed before thoſe of the ſecond.

467. But as it is ſtill more proper to have a regard to the Œconomy of theſe Parts, according to which, their Functions begin in ſome internal Parts, are continued in ſome external Parts, return again to the internal, and are finiſhed in the external; I ſhall follow the ſame Order in deſcribing them, and this is what I conſtantly obſerve in my public Lectures.

468. The firſt of theſe four Claſſes comprehends the ſpermatic Veins and Arteries; the ſecond, the Teſtes, Epididymes and Scrotum; the third, the Vaſa Deferentia, Veſiculæ Seminales, and Proſtates; and the fourth, the Corpora Cavernoſa, Urethra, Integuments, &c.

469. I formerly made a fifth Claſs out of ſome of theſe Parts, which I look'd upon as accompanying the reſt; but I now think it better to include them all in the four Claſſes that I have mention'd.

*The ſpermatic Veſſels.*

470. The ſpermatic Arteries go out moſt commonly from the anteriour Part of the inferiour Aorta, near each other, and about an Inch lower than the Arteriæ Renales. Their Origin oftentimes varies; for I have obſerved them to ariſe from the Renal Artery; and ſometimes they go out higher, lower or more laterally than is common, and each Artery has been ſeen to ariſe from different Places.

471. They run down obliquely in the poſteriour part of the Abdomen, within the cellular Subſtance of the Peritonæum, paſſing inſenſibly from behind, forward; and ſo parting gradually more and more from the Aorta, they croſs over the foreſide of the Ureters, and run through the Openings or Rings of the abdominal Muſcles, along with the Elongations or Productions of the cellular Portion of the Peritonæum.

472. They are ſmall at their Origin, and in their Courſe downward, they give off pretty conſiderable lateral Ramifications, to the Membrana Adipoſa, Peritonæum, and alſo to the Meſentery, where they ſeem to communicate with the Meſenteric Arteries.

473. They ſometimes paſs through the Areolæ, or Meſhes of the ſpermatic Veins; and before they go out of the Abdomen, they are divided into very fine Rami, which run in a more or leſs winding Courſe, almoſt parallel to each other.

474. Afterwards they enter the cellular Productions of the Peritonæum, which ſerve them for Vaginæ. They do not fluctuate indifferently from one ſide to the other of theſe Vaginæ; but are connected along their inner Surface by thin membranous Laminæ, which are likewiſe Continuations of the cellular Subſtance of the Peritonæum.

475. The Arteries continue the ſame winding Courſe within theſe Vaginæ, paſſing before the Vaſa Deferentia, which are likewiſe contained in them; and at length they terminate by Ramifications in the Epididymes and Teſtes, in the manner that ſhall be afterwards explained.

476. The ſpermatic Veins accompany the Arteries, and have nearly the ſame Courſe. The right Vein ariſes commonly from the Trunk of the Vena Cava, in the ſame manner as the Artery from the Aorta; and I have ſometimes obſerved it to go out from the Union of the right Renal Vein with the Vena Cava, and ſometimes I have ſeen three Veins on the right ſide, go out ſeparately from the Trunk of the Vena Cava. The left ſpermatick Vein ariſes moſt commonly from the Vena Renalis Siniſtra.

477. In their Courſe downward, they firſt join the Arteries, and together with them, enter the cellular Productions of the Peritonæum, to which they are connected in the ſame manner. From their Origin to their Paſſage through the Openings or Rings of the abdominal Muſcles, they ſend off ſeveral Rami to the Membrana Adipoſa of the Kidneys, Peritonæum and Meſentery, where they ſeem to communicate with the Venæ Meſaraicæ, and conſequently with the Vena Portæ.

478. A little below the place where they croſs over the Ureters, they ſend out a conſiderable Branch, which is afterwards divided into two Rami, one of which communicates with the Vena Capſularis, and the other oftentimes with the Renalis; and lower down they give out the Vein, which communicates with the Vena Meſaraica, as already obſerved.

479. They differ from the ſpermatic Arteries, not only in that they are larger, and their Coats thinner, but alſo in being more divided and multiplied, as they deſcend to the Rings of the abdominal Muſcles; and as they gradually produce a large Faſciculus of Ramifications, the Ancients gave to them and to the Arteries, the Name of Vaſa Pyramidalia.

480. These Ramifications often communicate with each other in this Courſe, and form a great number of Areolæ, Contortions and Convolutions, ſo as to repreſent a kind of Plexus, which is connected to the cellular Vagina of each ſide, by very fine Laminæ; and the Artery which accompanies the Vein, croſſes it in ſeveral places, and runs through the Areolæ in different Directions. Theſe frequent Convolutions gave riſe to the Name of Vaſa Pampiniformia, formerly given to theſe Veſſels; and their particular Adheſions to each other at ſome places, made it be believed, that there were real Anaſtomoſes between the Artery and the Vein.

481. *Leal Lealis* an *Italian* Anatomiſt not attending to the lateral Ramifications of the ſpermatic Arteries and Veins, believed himſelf able to eſtabliſh and demonſtrate theſe pretended Anaſtomoſes. The Experiments made by him on living Animals, prove nothing. His way was to make a common Ligature on both Veſſels, a little above the Teſticle, and another on the Trunk of the Vein, after he had emptied it. Then preſſing the Aorta to force the Blood into the ſpermatic Artery, the Vein which he had before emptied, was found to be preſently filled.

482. From thence he concluded, that the Courſe of the Blood to and from the Teſticle being obſtructed by the inferiour Ligature, there muſt be ſome Anaſtomoſes between the two Ligatures, through which the Vein was ſupplied with Blood. But it is very plain, that this Effect was owing to the lateral Ramifications of the ſpermatic Artery and Vein, and not to his pretended Anaſtomoſis. Theſe fine lateral Ramifications were well known to *Euſtachius*, but had eſcaped *Leal Lealis*.

*Teſtes.* 483. The Teſtes are two glandular Bodies, ſituated near each other, without the Abdomen, below the Interſtice between the Groins in an Adult. The Ancients named them Didymi or Gemini. Their ſize is nearly that of a Pidgeon's Egg, and they are of an oval Figure, a little flatted at each ſide. We may conſider in each Teſticle, two Extremities, two Edges, and two Sides. One Extremity is ſituated forward, and a little upward, the other backward, and a little downward; and their Edges lie upward and downward.

484. At the upper Edge, they have each an Appendix, called Epididymis, together with which it is involved in ſeveral Coverings; and they are both ſuſpended in a common Covering, called the Scrotum.

485. Each Teſticle is a ſpermatic Gland formed by a vaſt number of fine whitiſh Tubes, folded and twiſted in different manners, and diſtributed in different Faſciculi, between membranous Septa; the whole being ſurrounded by a ſtrong common Covering, named Tunica Albuginea.

486. These Septa are diſpoſed longitudinally, divaricating from each other on one ſide, and approaching on the other. They approach each other along one Edge of the Teſticle, and terminate in a long narrow whitiſh Body, as in a kind of Axis.

487. From thence they divaricate in a regular manner, and are fixed by their oppoſite Edges in the inner Surface of the Tunica Albuginea, of which they appear to be a Continuation. This white Body may be termed the Nucleus of the Teſticle.

488. From this Deſcription, we ſee that all theſe Septa are not of an equal Breadth; that the Interſtices between them are in ſome meaſure triangular; and that the Extent of the ſmall Tubes, which lie therein, muſt be very conſiderable. They have been reckoned to amount to many Ells, by taking the Sum of all their ſeveral Portions; and they may be eaſily unfolded by a long Maceration, which deſtroys the delicate Subſtance by which all their Folds and Convolutions are connected and tied down.

489. All theſe ſmall Canals ſeem to terminate by a ſmaller number of common Trunks at the white Body or Nucleus already mentioned; which Trunks do afterwards pierce the upper part of the anteriour Extremity of the Teſticle, and are diſpoſed in ſeveral Folds along the lateral external Part of the upper Edge, all the way to the poſteriour Extremity. From this Union ariſes a long whitiſh, plaited Faſciculus or Bundle, called Epididymis, which is a *Greek* Term ſignifying an Appendix to the Teſticle.

*Epididymis.* 490. The Epididymis thus formed, may be reckoned a Production of the Teſticle, or a kind of Teſtis Acceſſorius; and it reſembles in ſome meaſure an

Arch ſupported by its Center or Frame. It is more contracted at the middle, than at the Extremities, by which it is cloſely united to thoſe of the Teſticle.

491. Between its Extremities it does not immediately touch the Teſticle, but is only looſely connected to it, by the Duplicature of a very fine and almoſt tranſparent Membrane, as by a kind of Ligament. This Membrane is the Continuation and Duplicature of the Tunica Albuginea or proper Coat of the Teſticle, which having ſupplied the place of a Ligament to the Epididymis, afterwards inveſts it.

492. The Epididymis is flat, a little concave on the under ſide, or that next the Teſticle, irregularly convex on the upper ſide, or that turned from the Teſticle; and theſe two ſides are diſtinguiſhed by two angular Edges; by the innermoſt of which, it is connected to the Teſticle, in the manner already ſaid, but the outer Edge and flat ſide are looſe and free.

493. The anteriour Extremity or Head of the Epididymis ariſes from the Teſticle; and the poſteriour Extremity or Tail, which likewiſe adheres very cloſely to it, is incurvated from behind, forward, and a little upward, and contracting by degrees, forms a particular Canal, termed Vas Deferens, which ſhall be deſcribed after the Scrotum. By this Deſcription of the Extremities and Edges of the Epididymis, I demonſtrated many Years ago, a Method to diſcover whether a Teſticle view'd extra Situm belongs to the right or left ſide.

494. The Scrotum is the Cutaneous Covering of the Teſtes. Outwardly, it is a Bag common to both, formed by a Continuation of the Skin of the neighbouring Parts, and commonly very uneven, having a great number of Rugæ on its outer Surface. Interiourly it is fleſhy, and forms a muſcular Capſula for each Teſticle, termed Dartos. *Scrotum.*

495. The exteriour or cutaneous Portion of the Scrotum is nearly of the ſame Structure with the Skin in general, of which it is a Continuation; only it is ſomething finer, and it is likewiſe plentifully ſtored with ſebaceous Glands and Bulbs or Roots of Hairs.

496. Tho' it is a common Covering for both Teſticles, it is nevertheleſs diſtinguiſhed into two lateral Parts by a ſuperficial and uneven prominent Line, which appears like a kind of Suture, and from thence has been termed Raphe.

497. This Line is a Continuation of that which divides in the ſame manner, the Cutaneous Covering of the Penis, and it is continued through the Perinæum, which it divides likewiſe, all the way to the Anus. It is only ſuperficial, and does not appear on the inſide of the Skin.

498. The inner Surface of this cutaneous Bag is lined by a very thin cellular Membrane, through which the Bulbs and Glands appear very diſtinctly when we view its inſide. The Rugæ of the Scrotum are in the natural State commonly a Mark of Health, and then its Size is not very large. It increaſes in Size, chiefly according to its length, and then the Rugæ diſappear more or leſs according to the Degrees of the preternatural State or Indiſpoſition.

*Dartos.* 499. The Dartos or fleſhy Portion of the Scrotum, is a true cutaneous Muſcle; the Fibres of which are for the moſt part ſtrongly connected to the Skin, running through the cellular Subſtance which lies between theſe two Portions in place of a Membrana Adipoſa, but without the leaſt Appearance of Fat. This Muſcle is thin, and by the Diſpoſition of its Fibres forms a Bag with two Cavities, or two ſmall Bags joined laterally to each other, and contained within the cutaneous Portion.

500. The lateral parts of theſe two Bags, which are turned from each other, are longer than thoſe which are joined together; and by this Union a Septum is formed between the Teſtes, which may be called Mediaſtinum Scroti.

501. The Raphe or Suture already mentioned adheres to the Edge of this Septum, and thereby braces down the middle of the cutaneous Portion, which from thence appears to have in part two Cavities; and this was perhaps what gave occaſion to make the *French* Word for the Scrotum to be in the plural Number. The other Edge of the Septum adheres to the Urethra.

502. The two Bags of the Dartos are lined on the inner or concave ſide, by a cellular Subſtance more conſiderable than that between the convex ſide and the Skin; ſo that the fleſhy Fibres, all the way to the Septum, lie between two cellular Strata. They run through the outer Stratum, as has been ſaid, to be inſerted in the Skin, and by their Contraction, they form the natural Rugæ of the Scrotum.

503. Theſe fleſhy Fibres have likewiſe a ſtrict Connection with the internal cellular Membrane, eſpecially at the upper part, below the Groin, where the anteriour and external lateral Portions of the Dartos terminate by a kind of tendinous or ligamentary Expanſion, which is ſtrongly united to the internal cellular Membrane. I have often ſhown this, as a particular Faſcia Lata, which gives Inſertion to the Portions of the Dartos juſt mentioned, and as a broad Frænum which keeps the ſame Portions together.

504. The aponeurotic or ligamentary Expanſion of the Dartos is fixed in the Ramus of the Os Pubis, between the Muſculus Triceps and the Origin of the Corpus Cavernoſum of the ſame ſide, which ſhall be deſcribed hereafter; all the way to the lower part of the Symphyſis of theſe Bones. The internal Portion of theſe muſcular Bags, or that which forms the Septum Scroti is fixed to the Urethra by means of a Communication between the ſame ligamentary Expanſion, and another, which ſhall be explained in its proper place.

*Vaſa Deferentia.* 505. The Vaſa Deferentia are two white ſolid flatted Tubes, one lying on the right ſide, the other on the left. From the Epididymis of which they are Continuations, as has been already ſaid, each of them runs up in the cellular Vagina of the Spermatic Veſſels, as high as the Openings in the abdominal Muſcles; the Blood-Veſſels lying forward, and the Vas Deferens behind them.

506. This Faſciculus thus formed by the Blood-Veſſels, Vas Deferens, and their common Covering, is termed the Spermatic Rope. The Covering

ing is ſmoother on the outer than on the inner ſide, and for that reaſon it has been looked upon as a Vagina; the internal Subſtance of which is moſt cellular, and connects all the Veſſels together, while the external forms a Covering to inveſt them.

507. The Vas Deferens having reached the membranous Lamina of the Peritonæum, where that Lamina runs over the Orifice of the Vagina, ſeparates from the Blood-Veſſels, and runs backward, in form of an Arch, in the cellular Subſtance of the Peritonæum, as far as the neareſt ſide of the Bladder.

508. It paſſes afterwards behind the Body of the Bladder, to which it adheres very cloſely, as alſo to the Lamina of the Peritonæum which covers it, and then continues its arched Courſe towards the Neck of the Bladder; where both Vaſa Deferentia meet, and their Arches terminate.

509. In this Courſe, the Vas Deferens paſſes behind and croſſes the neighbouring umbilical Artery, croſſes the Extremity of the Ureter of the ſame ſide, in its paſſage between that Extremity and the Bladder, and having got behind the Bladder, it meets the Vas Deferens of the other ſide, between the Inſertions of the Ureters, and they run down together to the Neck of the Bladder.

510. This Canal, which at the Origin of the Epididymis is pretty large and plaited, becomes immediately afterward ſmaller and ſmoother, and continues in that form till it gets behind the Bladder, where it begins again to be larger and more uneven.

511. It ariſes from the angular Portion or poſteriour Extremity of the Epididymis, and from thence runs forward in a very oblique Courſe, on the poſteriour half of the Epididymis, where it is a little incurvated as it joins the backſide of the Spermatic Veſſels.

512. The Texture of the ſmooth Portion of this Canal is very ſolid, and in a manner Cartilaginous, eſpecially near the Surface of its Cavity, which though very narrow, is ſtill kept open by means of the Solidity and Thickneſs of its Sides.

513. The Cavity of the Vas Deferens is Cylindrical, though the whole Tube is flat, and its external Circumference oval, as may be ſeen by cutting it tranſverſely; and the Cavity inlarges as it paſſes behind the Bladder. The termination of theſe Canals muſt be referred to the Hiſtory of the Urethra.

*Coats of the Teſtes.*

514. The particular Coverings of the Teſtes are commonly called Coats; and they are reckoned to be three in number; the Tunica Muſculoſa, named Cremaſter, Vaginalis and Albuginea. The firſt two are common to each Teſticle, and to the Spermatic Rope that belongs to it; and the third is peculiar to the Teſticle alone.

515. The Tunica Vaginalis is the moſt conſiderable of the three, and muſt be deſcribed firſt, in order to conceive the Structure and Connexion of the Cremaſter, which is very improperly called a Coat. The Albuginea has been already deſcribed with the Teſtes.

516. The Tunica Vaginalis is a Continuation of the Vagina of the Spermatic Rope, which, as it approaches the Teſticle, is gradually dilated, and forms

ſorms two Capſulæ, one contained within the other, the external being the longeſt and broadeſt at bottom; ſo that there is a void Space there left between them, in which the Teſticle is lodged.

517. This Structure may likewiſe be explained in the following manner. The Vagina having reached as low as the Teſticle, is divided into two Laminæ, the innermoſt of which is the Bottom of the Vagina, and the outermoſt is expanded round the Teſticle, and gives it a Coat, called Vaginalis from the Latin Word *Vagina*. The Ancients termed it likewiſe Elytroides from a *Greek* Word that ſignifies the ſame thing.

518. The inner Surface of this Coat is lined by a fine Membrane, which ſtrengthens the Bottom of the Vagina, and forms a kind of Diaphragm, which prevents all Communication between the Vagina of the Spermatic Rope and the Tunica Vaginalis of the Teſticle.

*Cremaſter.* 519. The Cremaſter, improperly termed a Coat, is a thin Muſcle or fleſhy Plane, which runs down round the Vagina of the Spermatic Rope and terminates in the Tunica Vaginalis of the Teſticle.

520. It ſurrounds almoſt the whole Vagina, and afterwards expands itſelf on the upper and external part of the Tunica Vaginalis, in which it is inſerted and loſt.

521. It ariſes partly from the Ligamentum Falloppii, and partly from the lower Edge of the internal oblique Muſcle of the Abdomen; and on this account, it ſeems ſometimes to ariſe from the Spine of the Os Ilium; and it is probable that the Muſculus Tranſverſalis likewiſe contributes ſomething to its formation.

522. It is covered by a very fine cellular Membrane, detached from the outſide of the Aponeuroſis of the Obliquus Externus, round the Opening commonly called the Ring. This Membrane is loſt in the cellular Subſtance of the inſide of the Dartos.

523. From all this we ſee that the Cremaſter is rather a Muſcle of the Tunica Vaginalis, than a particular Coat. Thoſe among the Ancients, who believed it to be a Coat, called it Tunica Erythroides, from a *Greek* Word which ſignifies red; but this Muſcle is not always red, neither is that Colour eſſentially neceſſary to a fleſhy Subſtance.

*Corpora Cavernoſa.* 524. The Corpora Cavernoſa are two ligamentary and very limber Tubes, united laterally to each other, through the greateſt part of their length, and ſolid at their two Extremities, two of which are connected together, and rounded like the end of a Finger; the other two divaricate, like the Branches of the *Greek* Y, and diminiſhing gradually in Size after the Divarication, terminate in an oblique Point. Theſe divaricated and pointed Extremities may be called the Roots, and the round Extremities, the Heads.

525. These two Bodies are almoſt Cylindrical, being round, and of an equal Diameter from the Roots to the Heads, where they are in ſome meaſure Conical. The ligamentary Subſtance of their ſides is Elaſtic, and compoſed of fine cloſe Fibres, which are partly tranſverſe, and partly more or leſs oblique.

526. The Cavity of theſe ligamentary Tubes is intirely filled by a ſtrong cellular or cavernous Subſtance, which does not ſeem to be a Continuation of the Subſtance of the Sides. Theſe Cells communicate with each other, and are always more or leſs full of Blood, reſembling pretty much the cellular Subſtance of the Spleen, only with this difference, that the ſides of the Cells are thicker in theſe cavernous Bodies, and without any additional Subſtance.

527. By the Union of the two Corpora Cavernoſa, two external Grooves are formed, one on the upper ſide, the other on the lower. The lower Groove is ſomething broader than the upper, and it is filled through its whole length by a third Tube, narrower than the Corpora Cavernoſa, called the Urethra, which ſhall be preſently deſcribed.

528. The Roots of the Corpora Cavernoſa are fixed each, to the Edge of the ſmall Ramus of the Os Iſchium and Os Pubis. They meet at the Symphyſis of the Oſſa Pubis, where each of them becomes a Cylindrical Tube, and unites with the other in the manner already ſaid.

529. The Heads or rounded Extremities join the Baſis of a diſtinct Body, called the Glans, which is an Expanſion of the Urethra, and cloſely united to it in the manner that ſhall be explained hereafter.

530. By the Union of the Corpora Cavernoſa from their Roots to their round Extremities or Heads, a particular Septum is formed by the tranſverſe Fibres of both. Between the Fibres of this Septum, ſeveral ſmall void Spaces are left, by which the Corpora Cavernoſa communicate with each other, and therefore by blowing into one of them, we preſently inflate the other. Toward the rounded Extremities, the Septum diminiſhes every way.

531. The Urethra is the third ſpungy Tube which compoſes the Penis, *Urethra.* and it adheres to the Corpora Cavernoſa through the whole length of the inferiour Groove formed by their Union. It differs from the other two, both as it is narrower, and as it forms a true hollow Canal. Its Subſtance is Spungy or Cavernous, except a ſmall Portion next the Bladder, and its inner and outer Surfaces are membranous.

532. It is at firſt no more than a membranous Canal continued from the anteriour Opening of the Bladder, at the place called the Neck of the Bladder, which is a name that would be more proper for this Portion of the Urethra.

533. About a Finger's breadth and a half from its Origin, it joins a cavernous Subſtance like that of the two other Tubes, only ſmaller, which ſurrounds it through the whole extent of the inferiour Groove of the Corpora Cavernoſa.

534. But before this ſpungy Subſtance begins to ſurround the Urethra, it forms a diſtinct oblong Body, like a Pear or Onion, which is connected only to the lower convex ſide of the Canal, and afterwards being ſplit on each ſide, inveſts it quite round. This Body is called the Bulb of the Urethra, being larger than any other part of that Canal, and divided interiourly

by a very fine membranous Septum, into lateral Parts; and therefore when it is inflated, it appears to be double or with two Heads.

*Proſtatæ.* 535. The firſt Portion of the Urethra, or that which is not covered by the Cavernous Subſtance, and which from the Bladder to the Bulb is only a membranous Canal, is ſuſtained by a large ſolid whitiſh Maſs, of the Figure of a Cheſnut, and ſituated between the Bladder and the Bulb of the Urethra, its Baſis being toward the Bladder, the Apex or Point toward the Urethra, and the Sides lying upward and downward.

536. This Body is termed the Proſtates, from a *Greek* Word that expreſſes its Situation before the Veſiculæ Seminales, and implies a Plurality, becauſe it appears to be divided into two lateral Lobes, by a hollow Groove, which runs through its upper ſide from the Baſis to the Apex. The firſt Portion of the Urethra lies in this Groove, adhering very cloſely to the Proſtates which ſurround it.

537. The Body of the Proſtates lies on the Inteſtinum Rectum, and the Apex is under the internal Labium of the cartilaginous Arch of the Oſſa Pubis. The inner Subſtance is ſpungy, but very compact, and in each Lobe there are ſeveral Folliculi which open into the firſt Portion of the Urethra, toward the bottom of the Groove, as we ſhall ſee hereafter. The ſmall Portion of the Urethra, between the Apex of the Proſtates and the Bulb, perforates the Interoſſeous Ligament of the Oſſa Pubis deſcribed Nº 183. This Portion is very ſhort, its Length being no more than what is ſufficient to paſs through the Hole in the Ligament, the backſide of which conſequently touches the Apex of the Proſtates, and its foreſide, the Bulb of the Urethra. This Portion might be called the Neck of the Urethra, and that which lies between the Body of the Bladder and the Proſtates might be called the Neck of the Bladder.

*Glans.* 538. The ſpungy Subſtance of the Urethra having reached the Extremity of the Corpora Cavernoſa, forms a large Head, called the Glans, which crowns the three ſpungy Pillars, with this difference however, that it is a Continuation of the ſpungy Subſtance of the Urethra, and only adheres to the Extremity of the Corpora Cavernoſa without any direct Communication.

539. It is for this reaſon that if we blow into the ſpungy Subſtance of the Urethra, the Glans is preſently inflated, and no Air paſſes into the Corpora Cavernoſa; but when we blow into one of theſe Bodies, the Air paſſes immediately into the other, the Urethra and Glans remaining as they were.

540. The Figure of the Glans is that of a rounded Cone, a little flattened at the lower part, and with an oblique prominent Baſis, the Circumference of which is ſomething greater than that of the Corpora Cavernoſa.

541. The ſpungy Subſtance of the Glans is thick and uniform next the Corpora Cavernoſa, but next the Urethra, it is perforated by a Continuation of that Canal, and is there no thicker than the Urethra before the Formation of the Glans.

542. Therefore the Canal of the Urethra does not lie in the middle of the Glans, but continues its direct Courſe through the lower flat ſide of it, all the way to the Extremity, where it terminates by an oblong Orifice.

543. All the convex Surface of the Gland is covered by a fine villous Subſtance; and that again by a fine Membrane, reſembling the red part of the Lips. The Circumference of the Baſis of the Gland has a double row of ſmall Papillæ, which may be reckoned ſebaceous Glands, from which a thick Matter is diſcharged.

544. We have ſeveral things to take notice of in the Cavity of the Urethra. At the bottom of the Cavity of the firſt Portion or that which lies within the Proſtates, there is a ſmall oblong Oval Eminence, pretty large on the back part, and terminating forward in a Point, called Caruncula or Verumontanum. The large Portion of it is commonly perforated by two Holes, ſometimes only by one, and very ſeldom by three; and theſe are the excretory Orifices of the Veſiculæ Seminales, of which hereafter. Each Orifice has a ſmall thin membranous Border, which may ſerve for Valves to the excretory Ducts of the Veſiculæ. *Caruncula.*

545. On each ſide of the large Portion of the Caruncula, there are five or ſix Holes ranked in form of a Creſcent round its lateral Parts; which are the Orifices of the excretory Ducts of the Proſtates that come from the Folliculi already mentioned, and run in an oblique Courſe to the Orifices, in a kind of membranous Duplicature.

546. The Veſiculæ Seminales are ſoft whitiſh knotted Bodies, about three or four Fingers breadth in length, one in breadth, and about three times as broad as thick, ſituated obliquely between the Rectum and lower part of the Bladder, in ſuch a manner, as that their ſuperiour Extremities are at a diſtance from each other, and their lower Extremities united between thoſe of the Vaſa Deferentia, of which they imitate both the Obliquity and the Incurvation. *Veſiculæ Seminales.*

547. They are irregularly round on the upper part, and their breadth decreaſes gradually from thence. By the Union of their lower Extremities, they form a kind of Fork, the Branches of which are broad, and bent like Rams Horns. Theſe Extremities are very narrow, and form a ſmall Neck, which runs behind the Bladder towards its Orifice, and continues its Courſe in the Groove of the Proſtates, through the Subſtance of the contiguous Portion of the Urethra, till its Extremities pierce the Caruncula in the manner already ſaid.

548. The inner Subſtance of the Veſiculæ is plaited, and in a manner diſtinguiſhed into ſeveral Capſulæ, by contorted Folds. Their external Surface is covered by a fine Membrane, which ſerves for a Border and Frænum to the Folds, and is a true Continuation of the cellular Subſtance of the Peritonæum. The Veſiculæ may eaſily be unfolded, and all their Contorſions ſtreightened, and by this means they become much longer than in their natural State.

549. Their inner Surface is villous and glandular, and continually furniſhes a particular Fluid, which exalts, refines, and perfects the Semen, which they receive from the Vaſa Deferentia, and of which they are the Reſervatories for a certain time.

550. The Paſſage of the Vaſa Deferentia into the Veſiculæ, is very particular. I have already obſerved, that theſe Canals are incurvated behind the Bladder, and that their contracted Extremities unite at that place. They unite in an Angle, and run between the contiguous Extremities of the Veſiculæ; and this Union is ſo cloſe, that the adhering Portions ſeem to form only one middle Septum, between two ſmall Tubes, each of which is formed, partly by the Extremity of one Vas Deferens, and partly by that of the neighbouring Veſicula.

551. This lateral Union of the Extremities of the Vas Deferens, and Veſicula Seminalis on each ſide, forms likewiſe a kind of ſhort Septum, which terminates in a Creſcent, like a ſmall ſemilunar Valve, and the Extremity of the Vas Deferens is narrower than that of the Veſicula. By this Mechaniſm, the Fluid contained in each Vas Deferens has liberty to enter the contiguous Vaſicula, but that contained in the Veſicula cannot return into the other Canal.

552. If we blow into one of the Vaſa Deferentia, after having compreſſed the Urethra, the Air inflates the contiguous Veſicula Seminalis, and the Bladder of Urine, without paſſing into the Veſicula, or Canal of the other ſide, except we blow with too great Violence.

553. Afterwards the two ſmall Tubes, formed each by the Extremities of the Vas Deferens and Veſicula, run in between the Baſis of the Proſtates, and Canal of the Urethra; and perforating the ſides of that Canal obliquely, they terminate in the Caruncula, in the manner already ſaid.

*Lacunæ of the Urethra.* 554. The Inſide of the Canal of the Urethra is lined by a fine Membrane, full of capillary Blood-Veſſels; and its Surface is perforated by a great number of oblong Holes or ſmall Lacunæ of different ſizes, the largeſt lying near the Glands.

555. These Lacunæ, or Orifices of the excretory Ducts of the ſame number of ſmall Glands, are diſperſed through the Subſtance of the Urethra. Which Ducts run for ſome way in the ſpungy Subſtance, along the convex ſide of the internal Membrane of the Urethra, and open obliquely from behind, forward, into the great Canal. The Edges of the Lacunæ are ſemilunar, or like a Creſcent, becauſe of the Obliquity of their Opening.

*Anti-Proſtatæ.* 556. A little way from the beginning of the cellular Subſtance of the Urethra, we meet with two Lacunæ more conſiderable than the reſt, and their Ducts are very long. Theſe Lacunæ and Ducts lead to two glandular Bodies, ſituated on the two convex ſides of the ſpungy Subſtance of the Urethra near the Bulb. Each of them is about the ſize of a Cherry-ſtone, but they are oblong and flat, and covered intirely by the Muſcles called Acceleratores, of which hereafter. Theſe two Bodies are commonly called Proſtatæ inferiores; but if their Situation be carefully examined, they will be found to be higher than the true Proſtates. There is a third Body of the ſame kind ſituated more anteriourly.

557. The Cavity of the Urethra reſembles nearly that of a ſmall writing Pen. It is not every where round, and towards the Gland becomes broader and flatter on each ſide, eſpecially in the Gland itſelf, where there is a kind of oval or navicular Foſſula. *Orifice of the Urethra.*

558. This Canal terminates at the Extremity of the Glans by a narrow oblong Orifice or Fiſſure, which is much leſs than the reſt of the Cavity. The Commiſſures of this ſmall Fiſſure, are turned one toward the convex, the other toward the flat ſide of the Glans; and the Labia of the Fiſſure are its lateral Parts; and it ſeems to be ſurrounded by fleſhy Fibres.

559. The Integuments which cover all theſe Parts, are three or four in number. The firſt is the Skin with the Cuticula; the ſecond is the common cellular Membrane, which in this place ſeldom contains any Fat; the third is termed Nervous; and the fourth is a particular cellular Membrane, which is not always to be found. *The common Integuments.*

560. The firſt of theſe Integuments, the Skin, is a Continuation of that of the Pubis and Scrotum, and it adheres to the ſecond all the way to the Baſis of the Gland, where that ſecond Integument ends. The reſt of the Cutaneous Integument covers the Glans without adheſion, and terminates by an Opening. This Portion is named Præputium, and along the whole lower or back ſide, both of the whole Integument in general, and of the Præputium in particular, there runs a fine Suture, which is a Continuation of the Raphe of the Perinæum and Scrotum. *Præputium.*

561. The inner Surface of the Præputium is lined with a fine Membrane from the Opening all the way behind the Baſis of the Glans, and the ſame Membrane is folded from behind, forward, round the Glans, forming the proper Integument thereof, and covering very cloſely its whole villous Surface, as far as the Orifice of the Urethra, where it joins the Membrane, which lines the inſide of that Canal.

562. This proper Membrane of the Glans, and internal Membrane of the Præputium, form conjointly along the flat part of the Glans, from its Baſis to the Orifice of the Urethra, a membranous Duplicature, which like a Septum or Mediaſtinum divides this part into two lateral Portions, and limits the Motions of the Præputium; for which reaſon it is called Frænum Præputii.

563. The Surface of the internal Membrane of the Præputium diſcharges a Fluid which prevents it from adhering to the Glans; and perhaps ſerves likewiſe to dilute that which is collected at the Baſis of the Glans, from the Glandulæ Sebaceæ, already mentioned.

564. The ſecond common Integument of theſe Parts, is nearly the ſame with what is every where found under the Skin, except that it is not filled with Fat, and that it is more fibrous than cellular, and a little looſe. It accompanies the Skin to the Baſis of the Glans, as has been already obſerved.

*Ligamentum Suſpenſorium.* 565. The third common Integument, improperly called Tunica Nervoſa, is of a firm, elaſtic, ligamentary Subſtance, and its Fibres are ſometimes of a yellowiſh Colour. It inveſts the Corpora Cavernoſa and Urethra from the Glans to the Symphyſis of the Oſſa Pubis; and at ſome diſtance from theſe Bones, it forms on the ſuperiour Groove of the Corpora Cavernoſa, a cloſe Duplicature; and by this Duplicature, a flat broad Ligament, which runs directly upward, and is inſerted in the fore-mentioned Symphyſis, as far as the tendinous Baſis of the Muſculi Pyramidales of the Abdomen.

566. This Ligament has been called Ligamentum Elaſticum, becauſe it yields and recovers itſelf; and Suſpenſorium, becauſe it ſuſpends theſe Parts, by means of its Inſertion in the Symphyſis. It ſends off a Detachment or Ala toward each ſide, one Edge of which is fixed between the Muſculus Triceps and the Corpus Cavernoſum, and forms the ligamentary Expanſion in which the Dartos is inſerted, as has been already ſaid. It ſeems likewiſe to ſend down another Elongation directly to the Perinæum and Anus.

567. The fourth Integument of theſe Parts is the Tunica Celluloſa of M. *Ruyſch*, which immediately ſurrounds the Corpora Cavernoſa and Urethra, lying between theſe and the third Integument, from which it ſeems to be diſtinguiſhed only by the Cloſeneſs and Fineneſs of its Texture; and it is ſometimes hardly perceivable,

*The Muſcles.* 568. Several Muſcles are inſerted in the Parts, which we have deſcribed in this Paragraph. They may be reckoned to be ten in number, two for the Corpora Cavernoſa, two for the Urethra, two common Muſcles called Tranſverſales, and four ſmall ones for the Proſtates.

569. The firſt two Muſcles are commonly termed Erectores, but might be more properly named Iſchio-Cavernoſi. The next two are called Acceleratores, but the name of Bulbo-Cavernoſi would better agree to them. The four ſmall Muſcles, two of which are ſuperiour, and two inferiour, may be called Proſtatici. I obſerved in the beginning of the Deſcription of the Muſcles, that the Names taken from the ſuppoſed Uſes are very equivocal.

570. The Muſculi Iſchio-Cavernoſi lie along the Roots of the Corpora Cavernoſa; each of them being fixed by one Extremity very obliquely, in the internal Labium of the Ramus of the Os Iſchium, from the Tuberoſity upward. From thence it accompanies the Root of the Corpus Cavernoſum, all the way to the Symphyſis of the Oſſa Pubis, and is fixed by its other Extremity, in the Corpora Cavernoſa, near their Union; where the Fibres of both Muſcles meet, and are reciprocally expanded over both Corpora. They lie a little lower, and more interiourly than the Roots of theſe Cavernous Bodies.

571. I have ſhown two other Muſculi Acceſſorii, which I look'd upon as lateral Acceleratores, or as Acceleratores Acceſſorii; fixed lower, and more interiourly in the Os Iſchium, than the former, which they accompany all the way to the Corpora Cavernoſa, and then leaving them, they are inſerted chiefly in the Urethra, near the Bifurcation of the Muſculus Bulbo-Cavernoſus.

572

572. These Bulbo-Cavernoſi, commonly termed Acceleratores, form firſt of all, a Penniform Muſcle, by means of a middle Tendon, fixed in the lower part of the interoſſeous Ligament of the Oſſa Pubis, deſcribed Nº 184. and to the Union of the Muſculi Tranſverſales, with the Sphincters of the Anus. From which they paſs in an expanded Form over the Bulb of the Urethra, covering that Bulb and the Urethra itſelf, and adhering in ſome meaſure to both, as high as the Origin of the Ligamentum Suſpenſorium, the middle Tendon anſwering to the Septum of the Bulb.

573. Afterwards the two fleſhy Planes ſeparate, and run obliquely to the right and left Hands from behind, forward, and from below, upward; ſurrounding the Corpora Cavernoſa, in the outer ſides of which they are inſerted. The middle Tendon adheres very ſtrongly to the lower part of the Septum of the Bulb, in which, and in the Urethra it ſelf, ſeveral of the Fibres of theſe Muſcles are fixed.

574. The Muſculi Tranſverſi, called alſo Triangulares, are two long, narrow, fleſhy Faſciculi, inſerted each, by one Extremity in the Root or Beginning of the Ramus of the Os Iſchium; from whence they run tranſverſely along the Edge of the Interoſſeous Ligament of the Oſſa Pubis, as far as the Apex of the Proſtates, where their other Extremities meet, and form commonly a kind of Digaſtric Muſcle, the middle of which gives Inſertion to the Muſcles of the Urethra, and to the Cutaneous Sphincters of the Anus.

575. The ſuperiour Proſtatici are two thin Planes fixed in the upper part of the inſide of the ſmall Rami of the Oſſa Pubis, from whence they are ſpread over and inſerted in the Proſtates. Their Inſertions in the Oſſa Pubis are on one ſide of thoſe of the Obturatores Interni.

576. The Proſtatici inferiores are ſmall tranſverſe Planes, each of which is fixed in the Symphyſis, between the Ramus of the Os Pubis and Os Iſchium, and from thence runs tranſverſely, till it meets its fellow from the other ſide under the Proſtates, to which they are both ſtrongly connected, and they ſerve like a Girth to ſuſtain theſe Glands. They may be conſidered as two ſmall or internal Tranſverſales, and the other two Tranſverſales may be diſtinguiſhed by the Names of great or external. They have likewiſe ſome Adheſions to the Point in which all theſe Muſcles hitherto deſcribed, are united.

577. The Arteries of theſe Parts come chiefly from the Iliacæ Internæ or Hypogaſtricæ, and the reſt from the Iliacæ Externæ or Crurales. The principal Arteries are termed Pudicæ, of which one is external, the other internal. *Blood-Veſſels.*

578. The Pudicæ externæ ſend a Branch to each ſide, which having paſſed out of the Pelvis by the Side of the Os Sacrum, runs on the inſide of the Tuberculum Iſchii, to the Roots of the Corpora Cavernoſa, along the inſide of the Muſculi Iſchio-Cavernoſi or Erectores. It ſends Ramifications to the bulbous Head of the Urethra and to the Corpora Cavernoſa; and together with the Glutæa, with which it communicates in its paſſage, it likewiſe ſupplies the Scrotum.

579. The Pudicæ Internæ having furniſhed the Inteſtinum Rectum, Bladder, Veſiculæ Seminales and Proſtates, communicates with the Hæmorrhoidales, paſſes under the Arch of the Oſſa Pubis, and partly enters the Corpora Cavernoſa, and partly runs along their upper ſide, ſending off ſmall lateral Branches, which ſurround theſe Bodies, like irregular Half-Arches, and penetrate them by numerous Ramifications.

580. The Crural Arteries ſend each likewiſe a Branch, which running behind the contiguous crural Vein, is diſtributed to the Integuments of the Penis, by the Name of Pudica externa, and communicates by lateral Ramifications with thoſe of the Pudica interna. Theſe Communications are not only between the internal and external Pudicæ of the ſame ſide, but alſo between thoſe of both ſides, which reciprocally communicate with each other.

581. The Diſtribution of the Veins follows nearly that of the Arteries, but they have more Ramifications and Communications, as in other places. The principal Vein is that which paſſes directly under the Symphyſis of the Oſſa Pubis between the two Arteries, and runs along the whole ſuperiour Groove, formed by the Union of the Corpora Cavernoſa. It is very large, often double, and very ſeldom triple; but the Trunks do not ſeparate, while in the Groove, and it has a great number of Valves.

582. This great middle Vein is formed by the Union of the Hypograſtric Branches, which after paſſing on the two inner ſides of the Pelvis, meet about the middle of the Arch of the Oſſa Pubis. At this place we obſerve a venal Plexus, which covers the upper convex ſide of the firſt Portion of the Urethra, before it is ſurrounded by the ſpungy Subſtance.

583. The ſpermatic Veſſels, of which I have already deſcribed the Origin and Courſe all the way to where they go out of the Abdomen, having reached on each ſide, near the Teſticle, are divided into two principal Faſciculi, one of which is larger than the other. The largeſt is the anteriour, and is diſtributed through the Teſticle, by a prodigious number of very fine capillary Ramifications, which accompany all the Convolutions and Folds of the ſmall Canals.

584. The other Faſciculus is poſteriour, and is diſtributed to the Epididymis in the ſame manner.

585. The ſpermatic Artery is accompanied by a Ramus of the Epigaſtric Artery, which runs down on the ſide of it, as far as the Teſticle, where they communicate reciprocally with each other. There is ſometimes a ſmall Ramus of the Hypogaſtric Artery, which accompanies the Vas Deferens to the Epididymis, and there communicates with the Arteria Spermatica.

*Nerves.* 586. The Nerves of theſe Organs come from the Lumbares and Sacri, and they communicate with the Sympatheticus Maximus and Plexus Meſenterici. Near the Arch of the Os Pubis, they form together, on each ſide, a particular Rope, which paſſes under that Arch along the upper ſide of the neighbouring Corpus Cavernoſum, near the Artery already mentioned.

587. In their paſſage over the Corpora Cavernoſa, they ſend off a great many Rami, which ſurround theſe Bodies on all ſides, between the Skin and

ligamentary Integument; being ſo diſpoſed, as that the Arteries lie between them and the middle Vein. They muſt be examined preſently after the Skin has been raiſed, becauſe when the Ramifications are dried by the Air, they diſappear.

588. There are two Nerves which accompany the ſpermatic Rope, whereof one comes from the Nervi Lumbares, near the anteriour Spine of the Os Ilium, which is incurvated in its paſſage out of the Abdomen through the Muſcles, and ſerves to diſtinguiſh the Cremaſter. The other Nerve comes from the Plexus Renalis.

589. There is likewiſe one Nerve on each ſide, which being produced from the Union of the ſecond, third and fourth Pairs of the Nervi Sacri, eſpecially from the third; goes out of the Abdomen above the Ligamentum Iſchio-Sacrum, paſſes by the inſide of the Tuberoſity and ſmall Branch of the Os Iſchium, and is diſtributed to the Corpora Cavernoſa, to the Muſcles belonging to them, and to the neighbouring Parts.

### §. 21. *The Parts of Generation in Females.*

590. The Parts of Generation in Females, are ſeveral in number, ſome of them external, and ſome internal; and they are all ſubordinate to one principal internal part, called the Uterus. The other internal parts are the Tubæ Falloppianæ, Ovaria, Vaſa Spermatica, Ligamenta Lata, the Ropes or Bands called Ligamenta Rotunda, and the Canal of the Uterus. The external Parts are the Pubis, the Alæ, Nymphæ, Clitoris, Orifice of the Urethra, and Orifice of the Canal of the Uterus.

591. The Uterus lies between the Bladder and Inteſtinum Rectum. It *Uterus.* is a Body inwardly hollow, outwardly of a whitiſh Colour, of a pretty ſolid Subſtance, and except in time of Pregnancy, of the figure of a flat Flaſk, being in Adults about three Fingers breadth in length, one in thickneſs and two in breadth at one end, and ſcarcely one at the other. This Size varies according to the Age of the Subject.

592. The broadeſt Portion is termed the Fundus, and the narroweſt, the Neck. Its Situation is oblique, the Fundus being turned backward and upward, and the Neck, forward and downward; the broad ſides lie next the Rectum and Bladder, and the narrow ſides are lateral.

593. The Cavity of the Uterus is flat, and reſembles an oblong Triangle, the ſhorteſt ſide of which anſwers exactly to the Fundus, and the two longeſt ſides lie one on the right hand, the other on the left, and they are all bent inward, or toward the Cavity formed by them.

594. Of the three Angles of this Cavity, the two which terminate the Fundus, are perforated each by a narrow Duct, which with difficulty admits a Hog's Briſtle. The third Angle forms a flat Duct wider than the former, which perforates the Neck of the Uterus lengthwiſe, and terminates at the Extremity of that Neck, by a tranſverſe Opening.

595. This Opening is termed, the internal Orifice of the Uterus; and in the natural State, is narrower than the Duct of the Collum Uteri, ſo that

only a ſmall Stilet can be paſſed through it. At the Edge of this Orifice, are ſeveral ſmall Holes, anſwering to the ſame number of glandular Corpuſcles which diſcharge a viſcid Lympha.

596. The inner Surface of the Cavity of the Uterus, is lined by a very fine Membrane, which at the Fundus or broad Portion is ſmooth and even, but in the narrow Portion which leads to the Orifice, it is wrinkled in a particular manner.

597. The Portion of this Membrane, which covers the Bottom of the Cavity, is perforated by a great number of conſiderable Holes, through which ſmall Drops of Blood may be obſerved to paſs, when the whole Uterus is compreſſed; and ſometimes it appears to have very ſmall Hairs or Villi. Both theſe Villi and Holes are obſerved to be more or leſs tinged with Blood, in thoſe Women who die in the time of their Menſes.

598. In the narrow part, which anſwers to the Collum, each ſide is divided into two lateral Parts, by a kind of prominent longitudinal Line, which is larger in the upper or anteriour ſide, than in the lower or poſteriour.

599. On each ſide of theſe two longitudinal Lines, there are Lines or Rugæ obliquely tranſverſe, and diſpoſed like Branches, the longitudinal Lines repreſenting Trunks. Between and round theſe Rugæ, there are ſmall Lacunæ, through which a mucilaginous Fluid is diſcharged that cloſes the Orifice of the Uterus. We obſerve likewiſe in the Interſtices between the Rugæ, ſeveral tranſparent globular Corpuſcles, which a modern Author took for a kind of Ova.

*Structure of the Uterus.* 600. The Subſtance of the Body of the Uterus is ſpungy and compact, with a copious Intertexture of Veſſels. Its Thickneſs is nearly equal and uniform in the Sides and Edges, but the Fundus is thicker toward the middle, than toward the two Angles, where the thickneſs decreaſes gradually. The Edges are likewiſe much thinner near theſe Angles, than near the Extremity of the Neck.

601. The Uterus is covered by a Portion of the Peritonæum, which ſerves it for a Coat, and is the Continuation of that which covers the Bladder and Inteſtinum Rectum, running up from the lower and poſteriour part of the Bladder, over the anteriour part of the Uterus, and from thence over the Fundus, and down the backſide, and afterwards going to the Rectum.

602. On each lateral Part or Edge of the Uterus, this Portion of the Peritonæum, forms a broad Duplicature, which is extended on each ſide, more or leſs directly to the neighbouring lateral parts of the Pelvis, forming a kind of membranons Septum, between the anteriour and poſteriour Halves of the Cavity of the Pelvis; and it is afterwards continued in a looſe manner, with the Peritonæum, on the ſides of the Pelvis.

*Broad Ligaments of the Uterus.* 603. These two broad Duplicatures have the name of Ligamenta Lata, and Veſpertilionum Alæ. The upper Edge of each, is partly double, or folded, forming two ſmall diſtinct Duplicatures, which I term the Pinions of the broad Ligaments. The anteriour Pinion is more raiſed than the poſteriour, and they are both very looſe.

604.

604. The Laminæ of all theſe Duplicatures are connected by a cellular Subſtance, in the ſame manner as the other Duplicatures of the Peritonæum, and they contain the Falloppian Tube, the Ovaria, a part of the ſpermatic Veſſels, and of thoſe that go to the Body of the Uterus, the Ropes called the round Ligaments, the Nerves, *&c.*

605. The Ovaria are two whitiſh oval, flat, oblong Bodies, ſituated on the ſides of the Fundus Uteri, to which they are fixed by a kind of ſhort round Ligament, and incloſed together with it, in the Duplicature of the poſteriour Pinion of the Ligamenta Lata. *Ovaria.*

606. They are compoſed of a compact, ſpungy Subſtance, and of ſeveral little Balls, or tranſparent Veſiculæ, which are called Ova. The ſpungy Subſtance ſurrounds each of theſe Veſiculæ very cloſely, and ſeems likewiſe to furniſh them with diſtinct ſpungy Coverings or Calices. Theſe Veſiculæ are to be carefully diſtinguiſhed from other preternatural ones, termed Hydatides.

607. The Ligaments of the Ovaria, lie in the Edges of the poſteriour Pinions of the Ligamenta Lata, much in the ſame manner as the umbilical Vein, in the anteriour or umbilical Ligament of the Liver. They are round Ropes of a filamentary Texture, fixed by one Extremity to the Corner of the Fundus Uteri, a little above and behind the Level of that Fundus. They were formerly believed to be hollow, and look'd upon as Vaſa Deferentia.

608. The Falloppian Tubes are two flaccid, conical and vermiform Canals, ſituated more or leſs tranſverſely on each ſide of the Uterus, between the Fundus and the lateral parts of the Pelvis, and included in the anteriour Duplicatures or Pinions of the Ligamenta Lata. *Tubæ Falloppianæ.*

609. Each of them is fixed by its narrow Extremities in the Corner of the Fundus Uteri, into which it opens, tho' by ſo narrow a Duct, as hardly to admit a large Briſtle. From thence their Diameter augments by degrees all the way to the other Extremity, where it is about one third part of an Inch. The Body of the Tubæ goes in a winding Courſe, and their large Extremity is bent toward the Ovaria.

610. These large Extremities are irregularly round, and terminate by a narrow Orifice, a little plaited and turned toward the Ovarium, where it preſently expands in form of a membranous Fringe, full of Plaits and Inciſures. Theſe Fringes are called the broad Ends of the Falloppian Tubes.

611. The breadth of the Fringe is not equal in all parts. Its Circumference is in a manner oval, and the longeſt Segment of the Fringe reaches to, and is fixed in the Ovarium. The Folds are diſpoſed like Laminæ on the Concave ſide.

612. These Tubes are compoſed of fleſhy Fibres, whereof ſome are longitudinal, and ſome obliquely circular, with an Intertexture of another very fine Subſtance.

613. The anteriour Pinions of the Ligamentum Latum ſerve for a common or external Coat to both Tubæ, and alſo to connect them, in the ſame manner as the Meſentery, connects the Inteſtines. From thence

the Tubæ, and eſpecially their Fringes come to be looſe, and their Direction to be very imperfectly determined in the greateſt part of the Figures.

614. Their Cavity is lined by a ſoft glandular Membrane, which is plaited longitudinally, almoſt like the inner Surface of the Aſpera Arteria; and theſe Folds are ſtronger and broader near the great Extremities, than any where elſe. Their Subſtance ſeems to be ſpungy, and the Interſtices between them are moiſten'd more or leſs by a Fluid, which is continually diſcharged there.

*Blood-Veſſels.* 615. The Blood-Veſſels of theſe Parts are of different kinds, *viz.* the Hypogaſtric Arteries and Veins, the Ramifications of which, belong chiefly to the Body of the Uterus; the ſpermatic Veſſels, and the two vaſcular Ropes, called Ligamenta Rotunda, which might be more properly termed the vaſcular Ropes of the Uterus or of the Ligamenta Lata.

616. The Hypogaſtric Branches are arterial and venal Ramifications, ariſing from the Artery and Vein of the ſame Name, which having reached the lateral Edges of the Uterus, are diſtributed to all the parts thereof, both internal and external, forming a great number of Incurvations and particular Intertextures.

617. The Arteries of one ſide communicate both upon the Uterus, and through its whole Subſtance, with thoſe of the other ſide, and the arterial Ramifications of each ſide form numerous Anaſtomoſes with each other. The Veins communicate together on each ſide in the ſame manner; and all theſe Blood-Veſſels communicate likewiſe with the ſpermatic Veſſels, with the vaſcular Ropes of the Ligamenta Lata, and with the Hæmorrhoidales.

618. These frequent Anaſtomoſes may be demonſtrated by injecting, or blowing into the Hypogaſtric Veſſels, having firſt made proper Ligatures to prevent the Liquor or Air from running into other parts. The Extremities of theſe Arteries terminate and open into the Cavity of the Uterus, as has been already ſaid; and there is this peculiar to the Veins, that they communicate with the Hæmorrhoidales, and conſequently with the Vena Portæ.

619. The ſpermatic Veſſels, have nearly the ſame Origin in Females, as in Males, and likewiſe the ſame Courſe and Intertextures; but they never paſs out of the Abdomen, being wholly diſtributed to the Ovaria and Tubes, and they communicate with the Hypogaſtrics, and with the vaſcular Ropes of the Ligamenta Lata. The Veins are very large in proportion to the Arteries, and theſe Veſſels ſend out lateral Ramifications, which ſeem to communicate with the Meſaraicæ and Vena Portæ.

620. The vaſcular Ropes, commonly called the round Ligaments, are two long ſmall Faſciculi of Arteries and Veins, interwoven and connected together by a fine cellular Subſtance, and they run in the great Duplicature of the Ligamenta Lata, from each Corner of the Fundus Uteri, as far as the annular Openings of the abdominal Muſcles.

621. In this Courſe, each Rope thruſts outward or raiſes the anteriour Lamina of the Duplicature, which conſequently gives a kind of Coat to theſe vaſcular Faſciculi, and makes them appear like diſtinct Ropes, connected to this foreſide of the Duplicatures.

622. They ſeem to ariſe from the Communication between the Vaſa Spermatica and Hypogaſtrica, and might be reckoned a particular Continuation of the Spermatic Veſſels. The diſpoſition of their Adheſions to the Angles of the Fundus Uteri, with reſpect to that of the Tubes and Ligaments of the Ovaria which lie all near each other, is this: The Tubes lie higheſt, the Ligaments of the Ovaria moſt backward, and the vaſcular Ropes forward, and a little lower than the Ligaments of the Ovaria.

623. Afterwards they run in a Courſe, nearly reſembling that of the Spermatic Veſſels in Males, paſs out of the Abdomen, through the Openings of the abdominal Muſcles, and are loſt in the Fat of the upper and middle parts of the Groins. It may be conjectured, that theſe Veſſels furniſh the Lacunæ, of which hereafter. As they paſs out of the Abdomen, they are accompanied by a Production of the cellular Portion of the Peritonæum, as the Spermatic Rope in Men, and by a Faſciculus of fleſhy Fibres, repreſenting a kind of Cremaſter.

*Nerves, Lymphatics,* &c.

624. Besides all the Veſſels hitherto mentioned, we obſerve Nerves and Lymphatics, to which we may add the Lactiferous Ducts that are ſeen in an advanced Pregnancy. The Nerves come from the Lumbares, Sacri and Sympathetici Maximi, in the ſame manner as in Males. The Lymphatic Veſſels run chiefly in the Coats continued from the Peritonæum. I ſhall in another place explain the Lactiferous Ducts, and alſo the particular Fibres which ſeem to be interwoven in the Subſtance of the Uterus in a pregnant Woman, the innermoſt of which being diſpoſed in a vortical or turbinated manner, gave occaſion to *M. Ruyſch* to deſcribe them particularly by the name of Muſculus Uteri Orbicularis.

*Pubis.*

625. The Pubis is that broad Eminence at the lower part of the Hypogaſtrium, between the two Inguina, on which Hairs grow at a certain age, called in *Latin* by the ſame name, and almoſt of the ſame kind with thoſe found under the Axillæ. This Eminence is owing to a particular thickneſs of the Membrana Adipoſa which cover the forepart of the Oſſa Pubis, and ſome ſmall Portions of the neighbouring Muſcles.

*Sinus & Alæ.*

626. The longitudinal Cavity which reaches from the middle and lower part of the Pubes, within an Inch of the Anus, was by the Ancients termed Sinus; and they called the lateral parts of that Cavity Alæ, which is a more proper name than that of Labia, commonly given to them. The places where the Alæ are joined above and below, are termed Commiſſures; and may likewiſe be called the Extremities or Angles of the Sinus.

627. The Alæ are more prominent, and thicker above than below, and lie nearer each other below than above. They are chiefly compoſed of the Skin, cellular Subſtance and Fat. The exteriour Skin is a Continuation of that of the Pubes and Inguina. It is more or leſs even, and furniſhed with a great number of Glandular Corpuſcles, from which a whitiſh ceruminous Matter may be expreſſed; and after a certain age it is likewiſe covered in the ſame manner with the Pubes.

628.

628. The inner ſide of the Alæ is ſomething like the red Portion of the Lips of the Mouth; and it is diſtinguiſhed every where from the external ſide by a kind of Line, in the ſame manner as the red Portion of the Lips from the reſt of the Skin; being likewiſe thinner and ſmoother than the outward Skin. A great number of Pores are obſervable in it, and alſo numerous Glandular Corpuſcles which furniſh a Liquor more or leſs Sebaceous; and theſe Corpuſcles are larger near the Edges than in the other parts.

*Lacunæ.* 629. Near the inner Edge of the inner Surfaces of the Alæ, on each ſide of the Orifice of the Canal of the Uterus, we find a ſmall Hole more viſible than the reſt. Theſe two Holes are termed Lacunæ; and they communicate by two ſmall Ducts with the ſame number of Follicular Bodies lying in the Subſtance of the Alæ, and which may be looked upon as ſmall Proſtates anſwering to the Glandulæ Proſtaticæ in Males. When compreſſed they diſcharge a viſcid Liquor.

630. Above the ſuperiour Commiſſure, a thin flat Ligament runs down from each ſmall Branch of the Oſſa Pubis, which penetrates the Fat in the Subſtance of each Ala, and is loſt therein inſenſibly near the Edge. Theſe may be look'd upon as the Ligamenta Suſpenſoria of the Alæ. The inferiour Commiſſure of the Alæ is very thin or like a membranous Ligament, and together with the neighbouring parts of the inner Sides, it forms a Foſſula, termed Navicularis or Scaphoides. The Space between the inferiour Commiſſure and Anus, termed Perinæum, is about a large Finger's breadth in length.

631. The other external parts are ſituated in the Sinus, and hid by the Alæ. Directly under the ſuperiour Commiſſure lies the Clitoris, with its Covering, called Præputium. A little lower is the Orifice of the Urethra; and below that is the Orifice of the great Canal of the Uterus. The Circumference of this Orifice is bordered either by a membranous Circle, called Hymen, or by fleſhy Portions, termed Carunculæ Myrtiformes. On each ſide of the Clitoris begins a very prominent Fold, like a Criſta, which runs down obliquely on each ſide of the Orifice of the Urethra. Theſe Folds are termed Nymphæ, and they might likewiſe be named Criſtæ Clitoridis. On each ſide of the great Orifice lies the ſmall Proſtatic Hole already deſcribed.

*Clitoris.* 632. The Clitoris appears at firſt ſight like a ſmall imperforated Glans. Its upper and lateral ſides are covered by a kind of Præputium, formed by a particular Fold of a Portion of the inner ſide of the Alæ; which appears to be Glandular, and to diſcharge a certain Moiſture, and its inſide is granulated.

633. By diſſection, we diſcover in the Clitoris a Trunk and two Branches, as in the Penis, made up of a ſpungy Subſtance, and of very elaſtic Coats, but without any Urethra. This Subſtance may be inflated either by Air or by anatomical Injections into the Artery, &c. The Trunk is divided into two lateral parts by a middle Septum, from the Bifurcation, to the Glans, where it is inſenſibly loſt.

634. The Bifurcation of the Trunk is on the Edge of the cartilaginous Arch of the Oſſa Pubis; and the Branches which reſemble the Roots of the Corpora Cavernoſa are inſerted in the inferiour Rami of theſe Bones, and in thoſe of the Oſſa Iſchium, where they terminate by degrees; but there is ſometimes a membranous Tube on each ſide, which reaches to the Tuberoſity of the Iſchium.

635. The Trunk of the Clitoris is ſuſtained by a Ligamentum Suſpenſorium fixed in the Symphyſis of the Oſſa Pubis, and containing this Trunk in its Duplicature, nearly as in the other Sex.

636. Four Muſcles or Faſciculi of fleſhy Fibres are inſerted in the Trunk of the Clitoris, two on each ſide. One of them runs down on the foreſide of the neighbouring Corpus Cavernoſum, and is inſerted by a tendinous or aponeurotic Portion, partly in the Extremity of the Corpus Cavernoſum, and partly in the Tuberoſity of the Iſchium. Theſe two Muſcles are called Erectores, but the name of Iſchio-Cavernoſi would be more proper.

637. The other Muſcle on each ſide lies under the former, and runs down on the ſide of the Urethra and great Orifice of the Uterus, all the way to the Anus; increaſing gradually in breadth in its paſſage, and terminating partly like that which is called Accelerator in Males.

638. These two Muſcles ſurround very cloſely the lateral parts of the Urethra, and of the great Orifice. They expand very much as they deſcend, and are ſpread on the lower and lateral parts of the great Orifice; for which reaſon ſeveral Anatomiſts have looked upon them as muſcular Sphincters. All theſe four Muſcles, and eſpecially the two latter are oftentimes almoſt covered with Fat.

639. The Blood-Veſſels of the Clitoris come chiefly from the Hypogaſtricæ; and the Nerves from the ſecond and third Pairs of the Nervi Sacri, by means of which they communicate with the inferiour Meſenteric Plexus, and with the great Sympathetici.

*Nymphæ.*

640. The Nymphæ, Criſtæ Clitoridis, or as they may likewiſe be termed, Alæ Minores ſive Internæ, are two prominent Folds of the inner Skin of the great or external Alæ, reaching from the Præputium of the Clitoris to the two ſides of the great Orifice of the Uterus. They begin very narrow, and having increaſed in breadth in their Courſe downward, they are again contracted at their lower Extremity.

641. They are of a ſpungy Subſtance, intermixed with Glands, ſeveral of which may be perceived by the naked Eye. Their Situation is oblique, their upper Extremities lying near each other, and the lower at a much greater diſtance. In married Women they are more or leſs flaccid and decay'd.

*Urethra.*

642. By the Urethra in Females, we mean the urinary Duct, the Orifice of which is between the Nymphæ below the Glans of the Clitoris. The ſides of this Orifice are a little prominent and wrinkled, and perforated by ſmall Lacunæ, from which a viſcid or mucilaginous Liquor may be ſqueezed. In time of Pregnancy, this Orifice is ſometimes drawn a little inward.

643. The Body of the Urethra is a ſpungy Duct of the ſame Structure as in Males, but much ſhorter, ſituated directly under the Trunk of the Clitoris, and above the great Canal of the Uterus, adhering to each of theſe Canals between which it lies, by membranous Filaments. It paſſes under the cartilaginous Arch of the Oſſa Pubis, and terminates by an oblique Opening at the Neck of the Bladder; being bent a little downwards between its two Extremities.

644. The internal Membrane of the Urethra is a little plaited, and perforated by ſmall Holes, which communicate with Folliculi, lying hid in its Subſtance, as in Males. If we blow into one of theſe Holes, we obſerve a ſmall Canal to be inflated, which runs from without inwards, and terminates in ſome places by a kind of Sacculus, by compreſſing which, a viſcid Liquor is diſcharged.

645. The Continuation of this Membrane, which lines the Neck of the Bladder, forms likewiſe ſeveral Rugæ more or leſs equal, but that which lines the Cavity of the Bladder, is wrinkled in an irregular manner when the Bladder is empty.

*The Canal of the Uterus.*

646. The great Canal, formerly called the Neck of the Uterus, is ſituated below the Urethra, and above the Extremity of the Inteſtinum Rectum, a little obliquely, being more raiſed on the inner and back Part, than on the outer and fore part.

647. Its inner or poſteriour Extremity, joins the Extremity of the Body of the Uterus, and ſurrounds its Orifice much in the ſame manner as the Duodenum ſurrounds the Pylorus, or as the Ilium is ſurrounded by the Cæcum and Colon.

648. The anteriour Extremity forms the great Orifice, which lies under that of the Urethra, and above the Foſſula of the inferiour Commiſſure of the Alæ.

649. The Body of the Canal is chiefly made up of a ſpungy Subſtance, interwoven with numerous Blood-Veſſels, and it is commonly longer and narrower in Virgins, than in Married Women.

650. Its inner or concave Surface, has ſeveral tranſverſe Rugæ, and is covered by a particular Membrane. The Rugæ are formed by oblong narrow Eminences, incurvated like Portions of Arches, placed very near each other, and diſpoſed in ſuch a manner, as to divide the Cavity of the Canal, into an upper and lower ſide.

651. By the Union of the Extremities of the upper and lower Rugæ, a kind of Raphe or Suture is formed on the right and left ſides; and both Arches are ſometimes interſected in the middle, and ſo form two Half-Arches; but in this there is ſome Variety.

652. In general, theſe Arches are very conſiderable in young Perſons; become gradually more ſuperficial in married Women, and are quite loſt in time of Delivery.

653. The inner or poſteriour Extremity of this great Canal, ſurrounds the Orifice of the Uterus, a little obliquely, in ſuch a manner, as that the upper ſide of the Canal lies very near the Orifice, and the lower ſide, at a

greater diſtance from it, and this makes the Extremity of the Uterus appear to advance more into the Canal on the lower, than on the upper Part.

654. The exteriour or anteriour Extremity of the great Canal in Virgins, and eſpecially before the firſt Eruption of the Menſes, is commonly bordered by a circular membranous Fold, of different Breadths, more or leſs ſmooth, and ſometimes ſemilunar, which in ſome Subjects leaves but a very ſmall Opening, in others a larger Opening, and in all, renders the external Orifice narrower than the reſt of the Cavity. This Fold called Hymen, is formed by the Union of the internal Membrane of the great Canal, with that on the inſide of the Alæ, and repreſents a membranous Circle of different breadths, and ſometimes uneven. *Circulus Membranoſus.*

655. This membranous Circle is commonly ruptured after the Conſummation of Marriage; is quite loſt in Delivery; and afterwards only ſome irregular Portions of it remain, which from their ſuppoſed reſemblance to Myrtle Leaves, have been termed Carunculæ Myrtiformes. This Circle may likewiſe ſuffer ſome diſorder by too great a flux of the Menſes, by Imprudence, Levity and other particular Accidents. *Carunculæ.*

656. Each ſide of the anteriour Portion of the great Canal is covered exteriourly by a thin broad cavernous and vaſcular Plexus, called the Plexus Retiformis of that Canal. Theſe two Planes run down on each ſide of the Clitoris behind the Nymphæ, and likewiſe cover the Urethra like a Collar, before they are ſpread on the great Canal. *Plexus Retiformis.*

657. This Plexus is ſtrictly united to the muſcular Portions commonly taken for Accelerators or Conſtrictors, lying between theſe Portions and the lateral parts of the Urethra and of the great Canal.

658. This Plexus may be inflated by Air like a flaccid Spleen, or like the ſpungy Subſtance of the Clitoris, with which it ſeems to have ſome Communication; and on this Account the lateral Portions of this reticular Plexus have been named the internal Crura of the Clitoris. It is a kind of Rete Mirabile, compoſed of Veſſels which come chiefly from the Hypogaſtricæ.

659. It ſtill remains to be obſerved, that on each ſide of the bottom of the Pelvis in both Sexes, oppoſite to the lower part of the Bladder, there is an aponeurotic or tendinous Ligament, which runs over the inner Surface of the Muſculus Obturator Internus from before backward. The anteriour Extremity of this Ligament is fixed on one ſide of the middle Portion of the Symphyſis of the Oſſa Pubis; and the Poſteriour Extremity, to the middle part of the Ligamentum Sacro-Sciaticum deſcribed in Sect. II.

660. A little above the Elongation, called the Neck of the Bladder, there is another ligamentary Expanſion on each ſide of the Bladder; the forepart of which is narrow, and fixed to the anteriour Extremity of the Ligament already mentioned; and the broad poſteriour part, to the ſide of the Bladder. Theſe two lateral Expanſions may be look'd upon as proper Ligaments of the Bladder, by which it is connected to the inner ſide of both Oſſa Pubis.

661. To the anteriour Portion of each of theſe Ligaments of the Bladder is fixed a particular Faſciculus of fleſhy Fibres, which run up obliquely on the foreſide of the Bladder, on which thoſe of each ſide meeting together, form a kind of muſcular Intertexture, and unite with the moſt tranſverſe Fibres of the Bladder.

662. These two muſcular Faſciculi form a part, and perhaps the principal part of what is called the Sphincter of the Bladder; but to have a true Idea of them, they muſt be examined in Situ, without deſtroying any of their natural Connexions. When the Bladder is removed out of its place, as is done in the common Method of Diſſection, theſe Faſciculi are cut, and thereby their Direction being loſt, they appear tranſverſe, and are taken by thoſe who know no better, for Portions of an orbicular Sphincter.

663. In Males, theſe two Faſciculi are partly fixed in the Proſtates; but in Females they are very broad, and appear ſometimes to be double on each ſide, one Plane lying above the other. They are to be look'd upon as true Muſcles, fixed by ſmall Tendons on the ſides of the Symphyſis of the Oſſa Pubis.

# SECT. IX.

## *A Deſcription of the Thorax.*

### §. 1. *Introduction.*

1. IN the Compendious View Sect. VII. I gave a general Idea of all the external and internal Parts which compoſe what Anatomiſts call the middle Venter, Breaſt or Thorax in the Human Body; and I beg the Reader to turn to what was there ſaid, to prevent the neceſſity of repeating it here.

*External Conformation of the Thorax.*

2. THE whole extent of the Thorax in a living Subject, is commonly determined not only by the Sternum, Vertebræ of the Back and Ribs, but alſo by all that Space contained between the Articulations of the two Arms with the Scapulæ and Claviculæ; and in this ſenſe, the outſide of the Thorax is broader above than below in a healthy Subject, who has a moderate ſhare of Fleſh on his Bones.

3. THIS breadth of the upper part of the Breaſt is owing to the Pectorales Majores and Latiſſimi Dorſi viewed directly forward or backward. But when we take a direct lateral view of the Breaſt, it appears narrower above than below, not only in an intire Subject, but even after every thing has been removed that cover the ſides of the Thorax, and in the Skeleton itſelf.

4. THE common Integuments of the Thorax are the ſame with thoſe of the Abdomen; and the convex ſide of this part of the Body is likewiſe covered by ſeveral Muſcles. Anteriourly, we find the Pectorales Majores and Minores, a large Portion of the Serrati Majores, the Subclavii, a Portion of the Scaleni and of the Obliqui Abdominis Externi. Poſteriourly, we have all the Muſcles which cover both ſides of the Scapula, the Serrati Poſtici, and a part of the Sacro-Lumbares, Longiſſimi Dorſi, Vertebrales, &c. as in the Hiſtory of the Muſcles. Among all the external parts of the Thorax, only two are peculiar to it in the Human Body, I mean the two Eminences called Mammæ, which muſt therefore be deſcribed in this Section.

*Cavity of the Thorax.*

5. THE hard parts which form the ſides of the Cavity of the Thorax, are the twelve Vertebræ of the Back, all the Ribs, and the Sternum. The ſoft Parts which compleat the ſides, are the Membrane called Pleura, which lines the Cavity, and the Muſculi Inter-Coſtales, Sterno-Coſtales and Diaphragma, already deſcribed among the Muſcles.

6. ALL theſe hard and ſoft Parts taken together repreſent a kind of Cage, in ſome meaſure of a conical Figure, flatted on the foreſide, depreſſed on the backſide, and in a manner divided into two Nooks by the

Figure of the Vertebræ of the Back, and terminated below by a broad arched Baſis inclined backward. The Intercoſtal Muſcles fill up the Interſtices betwixt the Ribs, and ſo compleat the ſides of the Cavity; the Baſis is the Diaphragm, and the Pleura not only covers the whole inner Surface of the Cavity, but by forming the Mediaſtinum, divides it into two, one on the right Hand, the other on the left.

## §. 2. *Mammæ.*

7. The name of Mammæ or Breaſts is given to two Eminences more or leſs round, ſituated in the Anteriour and a little toward the lateral Parts of the Thorax, their Center or middle Part lying almoſt oppoſite to the bony Extremity of the ſixth true Rib on each ſide. Their Size and Figure vary in the different Sexes and different Ages.

8. In Children of both Sexes, and in Males of all Ages, they are commonly no more than Cutaneous Tubercles, or ſoft Verrucæ of a reddiſh Colour, called Papillæ or Nipples, each of them being ſurrounded by a ſmall, thin and pretty broad Circle or Diſk, more or leſs of a browniſh Colour and an uneven Surface, termed Areola.

9. In Females come to the Age of Puberty, which is ſometimes ſooner, ſometimes later, a third part is joined to the two former, which is a convex Protuberance, more or leſs round, of about five or ſix Fingers in breadth; the Papilla and Areola being ſituated near the middle of its convex Surface. This is what is properly termed Mamma, and it may be termed the Body of the Breaſt, when compared with the other two Parts. It increaſes with Age, and is very large in Women with Child, and in thoſe that give Suck. In old Age it decreaſes and becomes flabby, loſing its natural Conſiſtence and Solidity.

*Body of the Mammæ.*

10. The Body of the Mammæ is partly Glandular, and partly made up of Fat; or it is a Glandular Subſtance mixed with Portions of the Membrana Adipoſa, the Cellulous Pelliculæ of which ſupport a great many Blood-Veſſels, Lymphatics, and Serous or Lactiferous Ducts, together with ſmall Glandular Molleculæ which depend on the former; all of them being cloſely ſurrounded by two Membranes continued from the Pelliculæ.

11. The innermoſt of theſe two Membranes, which is, in a manner, the Baſis of the Body of the Mamma, is thick and almoſt flat, adhering to the Muſculus Pectoralis Major. The ſecond or external Membrane is thinner, forming a particular Integument for the Body of the Mamma, more or leſs convex, and adhering cloſely to the Skin.

12. The Corpus Adipoſum of the Mamma in particular, is a ſpungy Cluſter, more or leſs interlarded with Fat, or a Collection of Membranous Pelliculæ, which by the particular diſpoſition of their outer ſides, form a kind of Membrane in ſhape of a Bag, in which all the reſt of the Corpus Adipoſum is contained. The anteriour or outer Portion of this Bag, or

that which touches the Skin is very thin; but that ſide next the Pectoralis Major, is thick.

13. The Glandular Body contains a white Maſs, which is meerly a Collection of Membranous Ducts, narrow at their Origin, broad in the Middle, and which contract again as they approach the Papilla, near which they form a kind of Circle of Communication. They are named Ductus Lactiferi. *Ductus Lactiferi.*

14. The coloured Circle or Diſk already mentioned is formed by the Skin, the inner Surface of which ſuſtains a great number of ſmall Glandular Molleculæ, of that kind which *Morgagni* calls Glandulæ Sebaceæ. They appear very plainly all over the Areola, even on the outſide where they form little flat Heights or Eminences at different diſtances quite round the Circle. *Areola.*

15. These Tubercles are perforated by ſmall Holes, through which a kind of ſebaceous or cheeſy Matter more or leſs liquid, may be ſqueezed out. Sometimes this is a ſerous Liquor, ſometimes a milky Serum, and ſometimes pure Milk, eſpecially in Nurſes; and I have ſeen both ſerous and milky Drops come out at the ſame time.

16. From thence I am inclined to think that theſe Holes communicate with the Lactiferous Ducts, and that the Tubercles are a kind of Auxiliary Papillæ added to the true ones. The different Matters or Liquors that may be ſqueezed from the ſame Glandular Body, gives alſo room to think, that the Holes in them communicate by their Extremities with ſeveral other ſmaller Holes.

17. The Tubercle which lies in the Center of the Areola is termed Papilla, or the Nipple. It is of different Sizes in different Ages and Conſtitutions, and in the different Conditions of Females in particular. In Women with Child, or who give Suck, it is pretty large, and generally longer or higher than it is thick or broad; and when it happens to be ſhort, it cauſes great uneaſineſs to the Child. *Papilla.*

18. The Texture of the Nipple is ſpungy, elaſtic, and liable to divers changes of Conſiſtence, being ſometimes harder, ſometimes more flaccid. It ſeems to be made up chiefly of Ligamentary Faſciculi, the Extremities of which form the Baſis and Apex of the Nipple. Theſe Faſciculi appear to be gently folded or curled during their whole length, and if by drawing the Fibres out, theſe Folds be deſtroyed, they return again as ſoon as that Action ceaſes.

19. Between theſe ſpungy and elaſtic Faſciculi lie ſeven or eight particular Tubes at ſmall diſtances from each other, and all in the ſame Direction. Theſe Tubes end at the Baſis of the Papilla in the irregular Circle of Communication of the Lactiferous Ducts, and at the Apex, in the ſame number of almoſt imperceptible Holes or Orifices; and as they are cloſely united to the elaſtic Faſciculi, they are folded in the ſame manner with them.

20. The Body of the Papilla is covered by a thin Cutaneous Production, and by the Epidermis. Its outer Surface is uneven, being full of ſmall Tubercles and Wrinkles, among which thoſe near the Circumference of the Nipple, ſeem to have a tranſverſe or annular Diſpoſition, which however is not uniform.

21. This Diſpoſition or Direction ſeems to be owing to the elaſtic Folds already mentioned; and from this ſimple Structure it is eaſy to explain how infants in ſucking the Nipple, and Women in drawing the Teats of Cows, bring out the Milk. For the Excretory Tubes being wrinkled in the ſame manner as the Faſciculi, do by theſe Wrinkles or Folds, as by ſo many Valves, hinder the Milk contained in the Ducts from flowing out; but when the Nipple is drawn and elongated, the Tubes loſe their Folds, and the Paſſage becomes ſtreight. Beſides this, when they are drawn with a conſiderable Force, the whole Body of the Mamma is increaſed in length and contracted in breadth, and thereby the Milk is preſs'd into the open Tubes; and thus by barely preſſing the Body of the Breaſt, the Milk may be forced toward the Nipple, and even through the Tubes.

*Arteries, Veins, Nerves,* &c. 22. The Arteries and Veins diſtributed through the Mammæ, are Ramifications of the Arteriæ and Venæ Mammariæ, of which one kind comes from the Subclaviæ, and are named Mammariæ Internæ; the others from the Axillares, called Mammariæ Externæ.

23. These Veſſels communicate with each other, with thoſe near them, and with the Vaſa Epigaſtrica, as was obſerved in the Deſcription of the Arteries and Veins. The Nerves come chiefly from the Coſtales, and by means of theſe, communicate with the great Nervi-Sympathetici.

*Uſes.* 24. The uſe of the Mammæ in the Nouriſhment of Children is known to all the World: But it is not certainly known what the Papillæ and Areolæ in Males can be deſigned for. Milk has been obſerved in them, in Children of both Sexes; and this happened to one of my own Brothers when he was about two Years of Age.

## §. 3. *Pleura & Mediaſtinum.*

25. The Pleura is a Membrane which adheres very cloſely to the inner Surface of the Ribs, Sternum, and Muſculi Inter-Coſtales, Sub-Coſtales, and Sterno-Coſtales, and to the convex ſide of the Diaphragm. It is of a very firm Texture, and plentifully ſtored with Blood-Veſſels and Nerves, in all which it reſembles the Peritonæum; and likewiſe in that it is made up of an inner true Membranous Lamina, and a Cellular Subſtance on the outſide, which is a Production or Continuation of the Lamina.

26. The Cellular Portion goes quite round the inner Surface of the Thorax, but the Membranous Portion is diſpoſed in a different manner. Each ſide of the Thorax has its particular Pleura, intirely diſtinct from the other, and making, as it were, two great Bladders, ſituated laterally with reſpect to each other in the great Cavity of the Breaſt; in ſuch a man-

ner as to form a double Septum or Partition running between the Vertebræ and the Sternum, their other ſides adhering to the Ribs and Diaphragm.

27. This particular Duplicature of the two Pleuræ is termed Mediaſtinum. The two Laminæ of which it is made up are cloſely united together near the Sternum and Vertebræ; but in the middle, and toward the lower part of the foreſide, they are ſeparated by the Pericardium and Heart, as we ſhall ſee hereafter. A little more backward they are parted in a tubular Form by the Œſophagus, to which they ſerve as a Covering; and in the moſt poſteriour Part, a triangular Space is left between the Vertebræ and the two Pleuræ from above downward, which is filled chiefly by the Aorta.

28. Before the Heart, from the Pericardium to the Sternum, the two Laminæ adhere very cloſely, and there the Mediaſtinum is tranſparent, except for a ſmall Space near the upper Part, where the Thymus is ſituated; ſo that in this place there is naturally no Interſtice or particular Cavity. The apparent Separation is owing intirely to the common Method of raiſing the Sternum, as was plainly demonſtrated by *Bartholinus*, my firſt Maſter in Anatomy, in his Treatiſe of the Diaphragm publiſhed at *Paris* in 1676. I ſhall have occaſion to mention *Euſtachius*'s Tables, where the ſame Fault is ſaid to be found, in another place.

29. The Mediaſtinum does not commonly terminate along the middle of the inſide of the Sternum, as the common Opinion has been. I demonſtrated in the Year 1715, to the Academy of Sciences, that from above downward, it inclines toward the left ſide; and that if before the Thorax is opened, a ſharp Inſtrument be run through the middle of the Sternum, there will be almoſt the breadth of a Finger between the Inſtrument and the Mediaſtinum; provided that the Sternum remain in its natural Situation, and the Cartilages of the Ribs be cut at the diſtance of an Inch from it, on each ſide.

30. From all this we ſee not only that the Thorax is divided into two Cavities intirely ſeparated from each other, by a middle Septum without any Communication; but alſo that by the Obliquity of this Partition, the right Cavity is greater than the left; and from hence we may judge of the uncertainty of Trepanning the Sternum, which the Ancients have recommended in ſome caſes.

31. The Cellular Portion of the Pleura connects the Membranous Portion to the Sternum, Ribs, and Muſcles; to the Diaphragm, Pericardium, Thymus, and Veſſels; and in a Word, to whatever lies near the convex ſide of the Membranous Portions of the Pleura. It likewiſe inſinuates itſelf between the Laminæ of the Duplicature of which the Mediaſtinum is formed, and unites them together. It even penetrates the Muſcles, and communicates with the Cellular Subſtance in their Interſtices, all the way to the Membrana Adipoſa on the external convex ſide of the Thorax. In this the Pleura reſembles the Peritonæum.

32. The Surface of the Pleura turned to the Cavities of the Breaſt, is continually moiſtened by a Lymphatic Seroſity which tranſudes through the Pores of the Membranous Portion. This Fluid is ſaid to be ſecreted by imperceptible Glands; but the Exiſtence of theſe Glands has not been hitherto demonſtrated; as was likewiſe obſerved of the Glands of the Peritonæum.

*Arteries and Veins.*

33. The Arteries and Veins of the Pleura are chiefly Ramifications of the Intercoſtals; and theſe Ramifications are exceedingly numerous, and for the moſt part very ſmall. The Mammariæ Internæ and Diaphragmaticæ likewiſe ſend Branches hither, which communicate very frequently with thoſe that come from the Intercoſtals.

34. The Mediaſtinum has particular Veſſels called Arteriæ and Venæ Mediaſtinæ, which are commonly Branches of the Subclaviæ. The Mammariæ Internæ ſend likewiſe Ramifications to the forepart of it, the Diaphragmaticæ to the lower part, and the Inter-Coſtales and Œſophagææ to the backpart.

*Nerves.*

35. The Nerves are Ramifications of the true Inter-Coſtales, called otherwiſe Coſtales and Dorſales. Near the Vertebræ they communicate with the great Sympathetic Nerves, improperly called Inter-Coſtales, and but very little with the middle Sympathetici or thoſe of the eighth Pair.

*Uſes.*

36. The Pleura ſerves in general for an inner Integument to the Cavity of the Thorax. The Mediaſtinum cuts off all communication between the two Cavities, and hinders one Lung from preſſing on the other when we lie on one ſide. It likewiſe forms Receptacles for the Heart, Pericardium, Œſophagus, &c. and is continued over the Lungs in the manner which ſhall be explained hereafter.

37. Before we leave the Pleura, it muſt be obſerved that theſe Portions of it which adhere immediately to the Ribs, may be looked upon as the Perioſteum of their inner ſides. This Adheſion keeps the Pleura ſtretched, and hinders it from ſlipping or giving way. It likewiſe renders this Membrane extremely ſenſible of the leaſt Separation cauſed by a coagulated Lympha or accumulated Blood; the Nervous Filaments being likewiſe in this caſe very much compreſſed in Inſpiration, by the ſwelling of the Intercoſtal Muſcles.

### §. 4. *Thymus.*

38. The Thymus is an oblong Glandular Body, round on the upper Part, and divided below into two or three Lobes, of which that toward the left Hand is the longeſt. In the Fœtus it is of a pretty large Size, leſs in Children, and very little in aged Perſons. In Children it is of a white Colour, ſometimes mixed with red; but in an advanced Age its Colour is generally dark.

39. The greateſt part of the Thymus lies between the Duplicature of the Superiour and Anteriour Portion of the Mediaſtinum, and the great

Veſſels of the Heart, from whence it reaches a little higher than the Tops of the two Pleuræ, ſo that ſome part of it is out of the Cavity of the Thorax; and in the Fœtus and in Children, it lies as much without the Thorax as within it.

40. Its particular inward Structure and Secretions are not as yet ſufficiently known to determine its Uſes, which however ſeem to be deſigned more for the Fœtus than for Adults. It has Veſſels belonging to it called Arteriæ and Venæ Thymicæ.

## §. 5. *Cor.*

*Situation in general and Conformation.*

41. The Heart is a Muſcular Body ſituated in the Cavity of the Thorax on the anteriour part of the Diaphragm, between the two Laminæ of the Mediaſtinum. It is in ſome meaſure of a Conical Figure, flatted on the ſides, round at Top, and oval at the Baſis. Accordingly, we conſider in the Heart the Baſis, Apex, two Edges, and two Sides, one of which is generally flat, the other more convex.

42. Besides the Muſcular Body which chiefly forms what we call the Heart, its Baſis is accompanied by two Appendices called Auriculæ, and by large Blood-Veſſels, of which hereafter; and all theſe are included in a Membranous Capſula, named Pericardium.

43. It is hollow within, and divided by a Septum which runs between the Edges, into two Cavities called Ventriculi, one of which is thick and ſolid, the other thin and ſoft. This latter is generally termed the right Ventricle, the other, the left Ventricle, though in their natural Situation the right Ventricle is placed more anteriourly than the left, as we ſhall ſee hereafter.

44. Each Ventricle opens at the Baſis by two Orifices, one of which anſwers to the Auricles, the other to the Mouth of a large Artery; and accordingly one of them may be termed the Auricular Orifice, the other the Arterial Orifice. The right Ventricle opens into the right Auricle, and into the Trunk of the Pulmonary Artery; the left, into the left Auricle, and into the great Trunk of the Aorta. At the Edges of theſe Orifices are found ſeveral moveable Pelliculæ, called Valves by Anatomiſts; of which ſome are turned inward toward the Cavity of the Ventricles, called Triglochines, or Tricuſpides; others are turned toward the great Veſſels, called Semilunares or Sigmoidales. The Valvulæ Tricuſpides of the left Ventricle are likewiſe termed Mitrales.

*Ventriculi.*

45. The inner Surface of the Ventricles is very uneven, many Eminences and Cavities being obſervable therein. The moſt conſiderable Eminences are thick fleſhy Productions called Columnæ. To the Extremities of theſe Pillars are faſtned ſeveral Tendinous Cords, the other ends of which are joined to the Valvulæ Tricuſpides. There are likewiſe other ſmall ſhort Tendinous Ropes along both Edges of the Septum between the Ventricles. Theſe ſmall Cords lie in an obliquely tranſverſe Situation, and form a kind of Network at different diſtances.

46. The Cavities of the inner Surface of the Ventricles are ſmall deep Foſſulæ or Lacunæ placed very near each other, with ſmall prominent Interſtices between them. The greateſt part of theſe Lacunæ are Orifices of the Venal Ducts to be deſcribed hereafter.

*Structure of the Ventricles.*

47. The fleſhy or muſcular Fibres of which the Heart is made up, are diſpoſed in a very ſingular manner, eſpecially thoſe of the right or anteriour Ventricle; being either bent into Arches or folded into Angles.

48. The Fibres which are folded into Angles are longer than thoſe which are only bent into Arches. The middle of theſe Arches, and the Angles of the Folds, are turned toward the Apex of the Heart, and the Extremities of the Fibres, toward the Baſis. Theſe Fibres differ not only in length but in their Directions which are very oblique in all, but much more ſo, in the long or folded Fibres than in the ſhort ones which are ſimply bent.

49. It is commonly ſaid, that this Obliquity repreſents this Figure 8, but the compariſon is very falſe, and can only agree to ſome bad figures drawn by Perſons ignorant of the Laws of Perſpective.

50. All theſe Fibres, regard being had to their different Obliquity and Length, are diſpoſed in ſuch a manner, as that the longeſt form partly the moſt external Strata on the convex ſide of the Heart, and partly the moſt internal on the concave ſide; the middle of the Arches and the Angles meeting obliquely and ſucceſſively to form the Apex.

51. The Fibres ſituated within theſe long ones, grow gradually ſhorter and ſtreighter all the way to the Baſis of the Heart, where they are very ſhort and very little incurvated. By this Diſpoſition, the ſides of the Ventricles are very thin near the Apex of the Heart, and very thick toward the Baſis.

52. Each Ventricle is compoſed of its proper diſtinct Fibres, but the left Ventricle has many more than the right. Where the two Ventricles are joined, they form a Septum which belongs equally to both.

53. There is this likewiſe peculiar to the left Ventricle, that the Fibres which form the innermoſt Stratum of its concave ſide, form the outermoſt Stratum of the whole convex ſide of the Heart, which conſequently is common to both Ventricles; ſo that by carefully unravelling all the Fibres of the Heart, we find it to be made up of two Bags contained in a third.

54. The anteriour or right Ventricle is larger than the poſteriour or left, as was well obſerved by the Ancients, and clearly demonſtrated by *M. Helvetius.* They are both nearly of the ſame length in Men, and in ſome Subjects they end exteriourly in a kind of double Apex.

55. All the Fibres are not directed the ſame way, though they are all more or leſs oblique; for ſome end toward the right Hand, others toward the left; ſome forward, ſome backward, and others in the intermediate places; ſo that in unravelling them, we find that they croſs each other gradually, ſometimes according to the length of the Heart, and ſometimes according to its breadth.

56. The Tubes which croſs each other tranſverſely are much more numerous than thoſe which croſs Longitudinally; which ought to be taken notice of, that we may rectify the falſe Notions that have been entertained concerning the Motion of the Heart; namely, that it is performed by a contorſion or twiſting like that of a Screw, or that the Heart is ſhortned in the time of Contraction, and lengthned in Dilatation.

57. The Fibres which compoſe the inner or concave Surface of the Ventricles, do not all reach to the Baſis; ſome of them running into the Cavity, and there forming the fleſhy Columnæ, to which the looſe floating Portion of the Tricuſpidal Valves is faſtned by Tendinous Ropes.

58. Besides theſe fleſhy Pillars, the internal Fibres form a great many Eminences and Depreſſions, which not only render the inner Surface of the Ventricles uneven, but give it a great extent within a ſmall compaſs. Some of theſe Depreſſions are the Orifices of the Venal Ducts found in the Subſtance of the Ventricles, which have been already mentioned. The Circumferences of the great Openings at the Baſis of the Heart are Tendinous, and may be looked upon as the common Tendon of all the fleſhy Fibres of which the Ventricles are compoſed.

59. The Valves at the Orifices of the Ventricles are of two kinds; one kind allows the Blood to enter the Heart, and hinders it from going out the ſame way; the other kind allows the Blood to go out of the Heart, but hinders it from returning. The Valves of the firſt kind terminate the Auriculæ, and thoſe of the ſecond lie in the Openings of the great Arteries. The firſt are termed Semilunar or Sigmoidal Valves, the others Triglochines, Tricuſpidal, or Mitral. *Valvulæ.*

60. The Tricuſpidal Valves of the right Ventricle are fixed to its Auricular Orifice, and turned inward toward the Cavity of the Ventricle. They are three triangular Productions, very ſmooth and poliſhed on that ſide which is turned towards the Auricle, and on the ſide next the Cavity of the Ventricle, they have ſeveral Membranous and Tendinous Expanſions; and their Edges are notched or indented. The Valves of the Auricular Orifice of the left Ventricle are of the ſame Shape and Structure, but they are only two in number; and from ſome ſmall reſemblance to a Mitre, they have been named Mitrales.

61. These five Valves are very thin, and faſtned by ſeveral Tendinous Ropes to the fleſhy Columnæ of the Ventricles. The Cords of each Valve are fixed to two Pillars; and between theſe Valves there are other ſmall ones of the ſame Figure. They may all be termed Valvulæ Tricuſpides, Auriculares, or Venoſæ Cordis.

62. The Semilunar Valves are ſix in number, three belonging to each Ventricle, ſituated at the Mouths of the great Arteries; and they may be properly enough named Valvulæ Arteriales. Their concave ſides are turned toward the Cavity of the Arteries, and their convex ſides approach each other. In examining them with a Microſcope, we find fleſhy Fibres lying in the Duplicature of the Membranes of which they are compoſed.

63. They are truly Semilunar or in form of a Creſcent, on that ſide by which they adhere; but their looſe Edges are of a different Figure, each of them repreſenting two ſmall Creſcents, the two Extremities of which meet at the middle of this Edge, and there form a kind of ſmall Papilla.

*The Aorta in general.*

64. The great Artery that goes out from the left Ventricle, is termed Aorta. As it goes out, it turns a little toward the right Hand, and then bends obliquely backward to form what is called Aorta Deſcendens which I ſhall have occaſion to mention again hereafter. From about the middle of the convex ſide of this Curvature, three great Branches ariſe, which furniſh an infinite number of Ramifications to the Head and upper Extremities of the Body; as the deſcending Aorta does in the ſame manner to the Thorax, Abdomen, and lower Extremities.

*The Arteria Pulmonaris in general.*

65. The Trunk of the Artery which goes out from the right Ventricle is called Arteria Pulmonaris. This Trunk, as it is naturally ſituated in the Thorax, runs firſt of all directly upward for a ſmall Space, then divides laterally into two principal Branches, one for each Lung; that which goes to the right Lung being the longeſt, for a reaſon that ſhall be given hereafter.

*Auriculæ.*

66. The Auricles are Muſcular Bags ſituated at the Baſis of the Heart, one towards the right Ventricle, the other towards the left, and joined together by an inner Septum and external communicating Fibres, much in the ſame manner with the Ventricles; one of them being named the right Auricle, the other the left. They are very uneven on the inſide, but ſmoother on the outſide, and terminate in a narrow, flat, indented Edge, repreſenting a Cock's Comb, or in ſome meaſure the Ear of a Dog; and for that reaſon a famous Anatomiſt of *Leyden* would fain have diſtinguiſhed this Edge, by the particular name of Auricle, calling the reſt, the Bag. They open into theſe Orifices of each Ventricle, which I name Auricular Orifices; and they are Tendinous at their opening, in the ſame manner as the Ventricles.

67. The right Auricle is larger than the left, and it joins the right Ventricle by a common Tendinous Opening, as has been already obſerved. It has two other Openings united into one, and formed by two large Veins which meet and terminate there, almoſt in a direct Line, called Vena Cava Superior and Inferior. The notched Edge of this Auricle terminates obliquely in a kind of obtuſe Point, which is a ſmall particular Production of the great Bag, and is turned toward the middle of the Baſis of the Heart.

68. The whole inner Surface of the right Auricle is uneven, by reaſon of a great number of prominent Lines which run acroſs the ſides of it, and communicate with each other by ſmaller Lines, which lie obliquely in the Interſtices between the former. The lines of the firſt kind repreſent Trunks, and the others, ſmall Branches in an oppoſite Direction to each other. In the Interſtices between theſe Lines, the ſides of the Auricle are very thin and almoſt tranſparent, ſeeming to be formed meerly by the ex-

ternal and internal Coats of the Auricle joined together, eſpecially near the Point.

69. The left Auricle is in the Human Body, a kind of Muſcular Bag or Reſervoir, of a pretty conſiderable thickneſs and unequally ſquare, into which the four Veins open, called Venæ Pulmonares, and which has a diſtinct Appendix belonging to it, like a third ſmall Auricle. This Bag is very even on both ſides, for which reaſon, one might be led to call it the Trunk of the Pulmonary Veins, and its Appendix, the left Auricle. However, the Bag and Appendix have but one common Cavity; and therefore may ſtill be both comprehended under the common name of the left Auricle. In Men, the ſmall Portion may likewiſe be named the Appendix of the left Auricle, but in other Animals, the caſe is different.

70. This ſmall Portion or Appendix of the left Auricle is of a different Structure from that of the Bag or large Portion. Exteriourly, it reſembles a ſmall oblong Bag, bent different ways, and indented quite round the Edges. Interiourly, it is like the inſide of the right Auricle. The whole common Cavity of the left Auricle is ſmaller in an adult Subject than that of the right; and the fleſhy Fibres of this left Auricle croſs each other obliquely, in Strata differently diſpoſed.

*Arteriæ & Venæ Coronariæ.*

71. Besides the great common Veſſels, the Heart has Veſſels peculiar to itſelf, called the Coronary Arteries and Veins, becauſe they in ſome meaſure crown the Baſis of the Heart. The Coronary Arteries, which are two in number, go out from the beginning of the Aorta, and afterwards ſpread themſelves round the Baſis of the Heart, to the Subſtance of which they ſend numerous Ramifications.

72. The exteriour courſe of the Veins is pretty much the ſame with that of the Arteries, but they end partly in the right Auricle, and partly in the right Ventricle. They likewiſe terminate in the left Ventricle, but in ſmaller numbers; and in both they end by certain Venal Ducts, which open into the Foſſulæ or Lacunæ already taken notice of, in the uneven inner ſides of the Ventricles. There are likewiſe Lacunæ of the ſame kind in the Auricles between the prominent Lines beforementioned; and in the great Bag of the left Auricle, we had likewiſe ſmall Holes which ſeem to have the ſame uſe.

73. There are ſeldom more than two Arteries; of which one lies toward the right Hand, the other toward the left of the anteriour third part of the Circumference of the Aorta. The right Coronary Artery runs in between the Baſis and right Auricle, all the way to the flat ſide of the Heart, and ſo goes half way round. The left Artery has a like courſe between the Baſis and left Auricle, and before it turns on the Baſis, it ſends off a capital Branch, which runs between the two Ventricles. Another principal Branch goes off from the Union of the two Arteries on the flat ſide of the Heart, which running to the Apex, there joins the other Branch.

74. The Coronary Veins are diſtributed exteriourly, much in the ſame manner. Their Trunk opens principally into the right Auricle by a particular Orifice furniſhed with a Semilunar Valve. All the Coronary Veins

and their Ramifications communicate with each other, ſo that if we blow through a ſmall Hole made in any of theſe Branches, having firſt compreſſed the Auricles and large Veſſels, we obſerve that the Air ſwells all the Veſſels, and the Ventricles likewiſe by paſſing through the Ductus Venoſi.

*Particular Situation of the Heart.* 75. The Heart lies almoſt tranſverſely on the Diaphragm, the greateſt part of it being in the left Cavity of the Thorax, and the Apex being turned toward the bony Extremity of the ſixth true Rib. The Baſis is toward the right Cavity, and both Auricles, eſpecially the right, reſt on the Diaphragm.

76. The Origin or Baſis of the Pulmonary Artery in this natural Situation, the higheſt part of the Heart on the foreſide, and the Trunk of this Artery lies in a perpendicular Plane, which may be conceived to paſs between the Sternum and Spina Dorſi. Therefore ſome part of the Baſis of the Heart is in the right Cavity of the Thorax; and the reſt all the way to the Apex, is in the left Cavity; and it is for this reaſon that the Mediaſtinum is turned toward that ſide.

77. According to this true natural Situation of the Heart, the Parts commonly ſaid to be on the right ſide, are rather Anteriour; and thoſe on the left ſide, Poſteriour; and that ſide of the Heart which is thought to be the foreſide, is naturally the upperſide; and the backſide conſequently the lower ſide.

78. The lower ſide is very flat, lying wholly on the Diaphragm, but the upper ſide is a little convex through its whole length, in the Direction of the Septum between the Ventricles. And it may be proper here to remark, that though commonly received terms of Art may ſtill be retained, yet it is neceſſary to prevent their communicating falſe Ideas to thoſe who have not had an opportunity of making obſervations themſelves, or of being inſtructed by others.

*Pericardium.* 79. The Heart with all the Parts belonging to it, is contained in a Membranous Capſula called Pericardium, which is in ſome meaſure of a Conical Figure, and much bigger than the Heart. It is not fixed to the Baſis of the Heart, but round the large Veins above the Auricles, before they ſend off the Ramifications, and round the large Arteries, before their Diviſions.

80. The Pericardium is made up of three Laminæ, the middle and chief of which is compoſed of very fine Tendinous Filaments, cloſely interwoven and croſſing each other in different Directions. The internal Lamina ſeems to be a Continuation of the outer Coat of the Heart, Auricles and great Veſſels. The Trunks of the Aorta and Pulmonary Artery have one common Coat which contains them both as in a Sheath, and is lined on the inſide by a Cellular Subſtance, chiefly in that Space which lies between where the Trunks are turned to each other, and the ſides of the Sheath. There is but a very ſmall Portion of the inferiour Vena Cava contained in the Pericardium.

81. It is the middle Lamina which chiefly forms the Pericardium; and the Figure of this Bag is not ſimply Conical, its Apex or Point being very round, and the Baſis having a particular Elongation which ſurrounds the great Veſſels, as has been already ſaid, as amply, as the other Portion ſurrounds the Heart.

82. The Pericardium is cloſely connected to the Diaphragm, not at the Apex, but exactly at that place which anſwers to the flat or lower ſide of the Heart; and it is a very difficult Matter to ſeparate it from the Diaphragm in Diſſection. This adhering Portion is in ſome meaſure of a triangular Shape, anſwering to that of the lower ſide of the Heart; and the reſt of the Bag lies upon the Diaphragm, without any Adheſion.

83. The External Lamina or common Covering, as it may be called more properly, is formed by the Duplicature of the Mediaſtinum. It adheres to the proper Bag of the Pericardium by the Intervention of the Cellular Subſtance in that Duplicature, but leaves it where the Pericardium adheres to the Diaphragm, on the upper Surface of which it is ſpread, as being a Continuation of the Pleura.

84. The Internal Lamina is perforated by an infinite number of very ſmall Holes, through which a ſerous Fluid continually tranſudes, in the ſame manner as in the Peritonæum. This Fluid being gradually collected after Death, makes what is called Aqua Pericardii, which is found in conſiderable quantities, in opening dead Bodies while they remain freſh. Sometimes it is of a reddiſh Colour, which may be owing to a Tranſudation of Blood through the fine Membrane of the Auricles.

85. The Heart and Parts belonging to it, are the principal Inſtruments of the Circulation of the Blood. The two Ventricles ought to be conſidered as two Syringes ſo cloſely joined together as to make but one Body, and furniſhed with Suckers placed in contrary Directions to each other, ſo as that by drawing one of them, a Fluid is let in, and forced out again by the other. *Uſes in general.*

86. The Heart is made up of a Subſtance capable of Contraction and Dilatation. When the fleſhy Fibres of the Ventricles are contracted, the two Cavities are leſſened in an equal and direct manner, not by any Contorſion or Twiſting, as the falſe Reſemblance of the Fibres to a Figure of Eight, has made Anatomiſts imagine. For if we conſider attentively in how many different Directions and in how many places, theſe Fibres croſs each other, as has been already obſerved, we muſt ſee clearly that the whole Structure tends to make an even, direct and uniform Contraction, more according to the breadth or thickneſs, than according to the length of the Heart, becauſe the number of Fibres ſituated tranſverſely, or almoſt tranſverſely, is much greater than the number of longitudinal Fibres.

87. The fleſhy Fibres thus contracted do the Office of Suckers, by preſſing upon the Blood contained in the Ventricles, which Blood being thus forced toward the Baſis of the Heart, preſſes the Tricuſpidal Valves againſt each other, opens the Semilunares, and ruſhes with Impetuoſity

through the Arteries and their Ramifications, as through ſo many elaſtic Tubes.

*Syſtole.*

88. The Blood thus puſhed on by the Contraction of the Ventricles, and afterwards preſſed by the elaſtic Arteries, enters the Capillary Veſſels, and is from thence forced to return by the Veins to the Auricles, which like Retirements, Porches, or Anti-chambers, receive and lodge the Blood returned by the Veins during the time of a new Contraction. This Contraction of the Heart is by Anatomiſts termed Syſtole.

*Diaſtole.*

89. The Contraction or Syſtole of the Ventricles, ceaſes immediately, by the Relaxation of their fleſhy Fibres, and in that time the Auricles which contain the Venal Blood, being contracted, force the Blood through the Tricuſpidal Valves into the Ventricles, the Sides of which are thereby dilated and their Cavities inlarged. This Dilatation is termed Diaſtole.

*Circulation.*

90. In this manner does the Heart by the alternate Syſtole and Diaſtole of its Ventricles and Auricles, puſh the Blood through the Arteries to all the parts of the Body, and receive it again by the Veins. This is called the Circulation of the Blood, which is carried on in three different Manners.

91. The firſt and moſt univerſal kind of Circulation is that by which almoſt all the Arteries of the Body are filled by the Syſtole of the Heart, and the greateſt part of the Veins evacuated by the Diaſtole.

92. The ſecond kind of Circulation oppoſite to the firſt, is through the Coronary Veſſels of the Heart, the Arteries of which are filled with Blood during the Diaſtole of the Ventricles, and the Veins emptied during the Syſtole.

93. The third kind of Circulation is that of the left Ventricle of the Heart; through the Venal Ducts of which, a ſmall quantity of Blood paſſes, without going through the Lungs, which is the Courſe of all the remaining Maſs of Blood.

94. Besides theſe three different kinds of Circulation, there are ſome Peculiarities in the Courſe of the Blood which may be looked upon as particular Circulations. Such is the paſſage of the Blood through the Liver, Spleen, Corpora Cavernoſa of the Parts of Generation, and through the Cavernous Sinuſes of the Dura Mater. I do not here examine the Circulation peculiar to the Fœtus.

### §. 6. *Pulmones.*

*Situation in general and Figure.*

95. The Lungs are two large ſpungy Bodies of a reddiſh Colour in Children, greyiſh in adult Subjects, and bluiſh in old Age; filling the whole Cavity of the Thorax, one being ſeated in the right ſide, the other in the left, parted by the Mediaſtinum and Heart, and of a Figure anſwering to that of the Cavity which contains them; that is, convex next the Ribs, concave next the Diaphragm, and irregularly flatted and depreſſed next the Mediaſtinum and Heart.

96. When the Lungs are viewed out of the Thorax, they repreſent in ſome meaſure an Ox's Foot, with the forepart turned to the Back, the back-part to the Sternum, and the lower part to the Diaphragm.

*Diviſion and Figure in particular.*

97. They are diſtinguiſhed into the right and left Lung; and each of theſe into two or three Portions called Lobi, of which the right Lung has commonly three, or two and a half, and the left Lung two. The right Lung is generally larger than the left, anſwerably to that Cavity of the Breaſt, and to the Obliquity of the Mediaſtinum.

98. At the lower Edge of the left Lung, there is an indented Notch or Sinus oppoſite to the Apex of the Heart, which is therefore never covered by that Lung even in the ſtrongeſt Inſpirations, and conſequently the Apex of the Heart and Pericardium may always ſtrike againſt the Ribs; the Lungs not ſurrounding the Heart in the manner commonly taught. This Sinus is expreſſed in *Euſtachius*'s Tables.

*Structure.*

99. The Subſtance of the Lungs is almoſt all ſpungy, being made up of an infinite number of Membranous Cells, and of different ſorts of Veſſels ſpread among the Cells, in innumerable Ramifications.

*Coats.*

100. This whole Maſs is covered by a Membrane continued from each Pleura, which is commonly ſaid to be double; but what is looked upon as the inner Membrane is only an Expanſion and Continuation of a Cellular Subſtance which ſhall be ſpoken to, after I have deſcribed the Veſſels of this Viſcus.

*Bronchia.*

101. The Veſſels which compoſe part of the Subſtance of the Lungs are of three or four kinds; the Air-Veſſels, Blood-Veſſels and Lymphatics, to which we may add the Nerves. The Air-Veſſels make the chief part, and are termed Bronchia.

102. These Bronchia are Conical Tubes compoſed of an infinite number of Cartilaginous Fragments, like ſo many irregular Arches of Circles, connected together by a Ligamentary Elaſtic Membrane, and diſpoſed in ſuch a manner as that the lower eaſily inſinuate themſelves within thoſe above them.

103. They are lined on the inſide by a very fine Membrane, which continually diſcharges a Mucilaginous Fluid; and in the Subſtance of the Membrane are a great number of ſmall Blood-Veſſels, and on its convex ſide, many Longitudinal Lines which appear to be partly fleſhy, and partly made up of an elaſtic Subſtance of another kind.

104. The Bronchia are divided in all Directions into an infinite number of Ramifications, which diminiſh gradually in ſize; and as they become Capillary, change their Cartilaginous Structure into that of a Membrane. Beſides theſe very ſmall Extremities of this numerous Series of Ramifications, we find that all the ſubordinate Trunks from the greateſt to the ſmalleſt, ſend out from all ſides a vaſt number of ſhort Capillary Tubes of the ſame kind.

*Veſiculæ Bronchiales.*

105. Each of theſe numerous Bronchial Tubes is widened at the Extremity, and thereby formed into a ſmall Membranous Cell, commonly called a Veſicle. Theſe Cells or Folliculi are cloſely connected together in

Bundles; each ſmall Branch producing a Bundle proportionable to its extent and the number of its Ramifications.

*Lobuli.* 106. These ſmall Veſicular or Cellulous Bundles are termed Lobules; and as the great Branches are divided into ſmall Rami, ſo the great Lobules are divided into ſeveral ſmall ones. The Cells or Veſicles of each Lobule have a free communication with each other, but the ſeveral Lobules do not communicate ſo readily.

*Interlobular Subſtance.* 107. The Lobules appear diſtinctly, to be parted by another Cellulous Subſtance, which ſurrounds each of them in proportion to their extent, and fills up the Interſtices between them. This Subſtance forms likewiſe a kind of irregular Membranous Cells, which are thinner, looſer, and broader than the Bronchial Veſicles.

108. This Subſtance is diſperſed through every part of the Lungs, forms cellulous or ſpungy Vaginæ which ſurround the Ramifications of the Bronchia and Blood-Veſſels, and is afterwards ſpread over the outer Surface of each Lung, where it forms a kind of fine Cellular Coat, joined to the general Covering of that Viſcus.

109. When we blow into this Interlobular Subſtance, the Air compreſſes and flattens the Lobuli; and when we blow into the Bronchial Veſicles they preſently ſwell, and if we continue to blow with force, the Air paſſes inſenſibly into the Interlobular Subſtance. We owe this Obſervation to *M. Helvetius.*

*Vaſcular Texture.* 110. All the Bronchial Cells are ſurrounded by a very fine Reticular Texture of the ſmall Extremities of Arteries and Veins which communicate every way with each other. The greateſt part of this admirable Structure is the diſcovery of the illuſtrious *Malpighi.*

*Blood-Veſſels.* 111. The Blood-Veſſels of the Lungs are of two kinds; one common, called the Pulmonary Artery and Veins; the other proper, called the Bronchial Arteries and Veins.

112. The Pulmonary Artery goes out from the right Ventricle of the Heart; and its Trunk having run almoſt directly upward as high as the Curvature of the Aorta, is divided into two lateral Branches, one going to the right Hand, called the right Pulmonary Artery, the other to the left, termed the left Pulmonary Artery. The right Artery paſſes under the Curvature of the Aorta, and is conſequently longer than the left. They both run to the Lungs, and are diſperſed through their whole Subſtance by Ramifications nearly like thoſe of the Bronchia, and lying in the ſame Directions.

113. The Pulmonary Veins having been diſtributed through the Lungs in the ſame manner, go out on each ſide, by two great Branches which open laterally into the Reſervoir or Muſcular Bag of the right Auricle.

114. The Ramifications of theſe two kinds of Veſſels in the Lungs, are ſurrounded every where by the Cellular Subſtance already mentioned, which likewiſe gives them a kind of Vagina; and the Rete Mirabile of *Malpighi*, deſcribed above, is formed by the Capillary Extremities of theſe Veſſels. It muſt be obſerved, that the Ramifications of the Arteries are

more numerous and larger than thoſe of the Veins, which in all other parts of the Body exceed the Arteries both in number and ſize.

*Bronchial Arteries and Veins.*

115. Besides theſe capital Blood-veſſels, there are two others called the Bronchial Artery and Vein. The Artery has become very famous of late, by the Deſcription given of it by *M. Ruyſch.* The Vein was doubted of for ſome time, but it exiſts as really as the Artery, and may be eaſily demonſtrated.

116. These two Veſſels are very ſmall, appearing only like very fine Arteries and Veins coming from the Aorta, Vena Cava and their Branches, in the manner already ſaid in the Deſcription of the Arteries and Veins; and they ſeem to have no other uſe but that of nouriſhing the Lungs.

117. The Varieties in the Origins of the Bronchial Arteries and Veins, eſpecially of the Arteries, their Communications or Anaſtomoſes with each other, and with the neighbouring Veſſels, and above all, the immediate Anaſtomoſis of the Bronchial Artery with the common Pulmonary Vein are of ſo great conſequence in the practice of Phyſick, that it will be proper to repeat here what I have ſaid about them elſewhere, that the attention of the Readers may not be diverted by being obliged to turn to another place of this Work.

118. The Bronchial Arteries come ſometimes from the anteriour part of the Aorta Deſcendens Superior, ſometimes from the firſt Intercoſtal Artery and ſometimes from one of the Œſophagææ. They go out ſometimes ſeparately, toward each Lung, ſometimes by a ſmall common Trunk which afterwards divides to the right and left, near the Bifurcation of the Aſpera Arteria hereafter to be deſcribed, and follow Ramifications of the Bronchia.

119. The left Bronchial Artery comes pretty frequently from the Aorta and the Right, from the ſuperiour Intercoſtal on the ſame ſide, becauſe of the Situation of the Aorta. There is likewiſe another which ariſes from the Aorta poſteriourly near the Superiour Intercoſtal, and above the Anterior Bronchialis.

120. The Bronchial Artery gives off a ſmall Branch to the Auricle of the Heart on the ſame ſide, which communicates immediately with the Coronary Artery.

121. In the Year 1719, I obſerved a very plain Anaſtomoſis between ſome Branches of the left Pulmonary Vein, and of one of the Arteriæ Œſophagææ, which came from the firſt left Intercoſtalis, together with a Bronchial Artery of the ſame ſide.

122. In that or the following Year, I obſerved likewiſe an Anaſtomoſis between the left Bronchial Artery and the Vena Azygos; and in the Month of *April* 1721, I ſaw an Anaſtomoſis between a Branch of this Artery, and the Body of the juſt mentioned Vein.

123. Sometimes one Bronchial Artery gives Origin to ſeveral Superior Intercoſtales; and ſometimes ſeveral Bronchial Arteries ſend off ſeparately the ſame number of Intercoſtals.

124. The Bronchial Veins, as well as Arteries, were known to *Galen*. Theſe Veins are ſometimes Branches of the Arygos, coming from the upper part of the Curvature or Arch. The left Vein is ſometimes a Branch of the common Trunk of the Intercoſtales of the ſame ſide; and ſometimes both Veins are Branches of the Gutturalis.

*Nervi.* 125. The Lungs have a great many Nerves diſtributed through them by Filaments which accompany the Ramifications of the Bronchia and Blood-Veſſels, and are ſpread on the Cells, Coats, and all the Membranous Parts of the Lungs. The Nervi Sympathetici Medii and Majores, commonly called the Nerves of the eighth Pair, or the Intercoſtals, form behind each Lung a particular Intertexture, called Plexus Pulmonaris, from whence nervous Filiments go out, which communicate with the Plexus Cardiacus and Stomachicus.

*Vaſa Lymphatica.* 126. On the Surface of the Human Lungs, between the external and cellular Coat, we obſerve ſomething that looks like Lymphatic Veſſels; but we ought to take care not to miſtake for ſuch Veſſels, a tranſparent Reticular Subſtance obſervable on the Surface of the Lungs, after blowing ſtrongly into the Lobuli; this appearance being intirely owing to the Air which paſſes through the Bronchial Veſicles into the Interlobular Cells, and which by ſeparating a certain number of Lobuli, finds room to lodge between them. The true Lymphatic Veſſels of the Lungs are moſt viſible in Brutes; and in a Horſe particularly, I have obſerved one of theſe Veſſels to run along a great part of one Edge of the Lungs.

*Ligaments.* 127. Under the Root of each Lung, that is under that part formed by the ſubordinate Trunk of the Pulmonary Artery, by the Trunks of the Pulmonary Veins, and by the Trunk of the Bronchia, there is a pretty broad Membranous Ligament which ties the Poſteriour Edge of each Lung to the lateral Parts of the Vertebræ of the Back, from that Root all the way to the Diaphragm.

*Trachea Arteria.* 128. The Bronchia already deſcribed are Branches or Ramifications of a large Canal, partly Cartilaginous, and partly Membranous, called Trachea or Aſpera Arteria. It is ſituated Anteriourly in the lower part of the Neck, from whence it runs down into the Thorax between the two Pleuræ, through the upper Space left between the Duplicature of the Mediaſtinum, behind the Thymus.

129. Having reached as low as the Curvature of the Aorta, it divides into two lateral Parts, one toward the right Hand, the other toward the left, which enter the Lungs, and are diſtributed through them in the manner already ſaid. Theſe two Branches are called Bronchia, and that on the right ſide is ſhorter than that on the left, whereas the right Pulmonary Artery is the longeſt.

130. The Trachea is made up of Segments of Circles or Cartilaginous Hoops, diſpoſed in ſuch a manner, as to form a Canal open on the back-part, the Cartilages not going quite round; but this Opening is filled by a ſoft Glandular Membrane, which compleats the Circumference of the Canal.

131. Each Circle is about the twelfth part of an Inch in breadth, and about a quarter of that Space in thickneſs. Their Extremities are round; and they are ſituated horizontally above each other, ſmall Interſtices being left between them, and the lower Edge of the ſuperiour Segments being turned toward the upper Edge of thoſe next below them.

132. They are all connected by a very ſtrong elaſtic Membranous Ligament fixed to their Edges. I have obſerved the firſt three Segments united into one bent alternately in two different places according to its breadth. Sometimes two are continuous in the ſame manner.

133. The Canal of the Aſpera Arteria is lined on the inſide by a particular Membrane which appears to be partly Fleſhy or Muſcular, and partly Ligamentary, perforated by an infinite number of ſmall Holes more or leſs imperceptible, through which a Mucilaginous Fluid continually paſſes, to defend the inner Surface of the Trachea againſt the Acrimony of the Air which we breathe.

134. This Fluid comes from ſmall Glandular Bodies diſperſed through the Subſtance of the Membrane, but eſpecially from Glands ſomething larger than the former, which lie on the outer or poſteriour Surface of that ſtrong Membrane, by which the circumference of the Canal is compleated. The ſame Structure is obſervable in the Ramifications of the Trachea from the greateſt to the ſmalleſt.

135. All the Veſſels of which the Lungs are chiefly compoſed, that is, the Air-Veſſels or Bronchia; and Blood-Veſſels, that is, the Pulmonary and Bronchial Arteries and Veins, accompany each other through this whole Viſcus.

136. They are diſpoſed commonly in ſuch a manner even to the laſt Ramifications, as that a ſubordinate Trunk or Branch of the Bronchia lies between the like Trunks or Branches of the Pulmonary Artery and Vein; the Bronchial Veſſels being immediately joined to the Bronchia. In ſome places theſe three kinds of Veſſels touch each other in ſuch a manner as to leave a Triangular Space in the middle.

137. The Bronchia are divided into a very great number of Ramifications; and the laſt Rami are the Pedicles or Footſtalks of the ſmall Lobuli. All the Lobuli are angular, oblong, broad, thin, &c. The Footſtalks ſend out other ſmaller Membranous Pedicles, which are very ſhort, and terminate in the Bronchial Veſicles or Cells, of which they are continuations. The ſubordinate Trunks and Rami detach a great number of theſe Pedicles from their convex Surface.

138. When we blow into the Lungs, the Bronchial Cells neareſt their outer Surface, appear like ſmall Portions of round Veſicles; and from this appearance, all the Bronchial Cells have got the name of Veſicles, though they are all Angular, except thoſe which I have now mentioned.

139. When we examine a Lung without blowing it up, we find that the Cartilaginous Segments of the Bronchia lie ſo near as to be ingaged in each other; and in drawing out any Portion of the Bronchia by the two Ends, theſe Segments are parted, and the whole Canal is increaſed in length;

but it contracts again by means of its elaſtic Membrane as ſoon as that force is taken off.

140. When we open lengthwiſe any Portion of the Pulmonary Artery and Vein in the ſame Lung, we meet with a great number of tranſverſe Rugæ which are deſtroyed when theſe Veſſels are elongated. This is an Obſervation made by M. *Helvetius.*

141. By vertue of this Structure, all the Ramifications both of the Bronchia and Pulmonary Arteries and Veins, have conſtantly the ſame Direction, whether the Lung be inflated or collapſed; and they contract in length without being either contorted or folded. In Expiration theſe Veſſels are elongated, and ſhortened in Inſpiration.

142. These three Veſſels lie in a ſort of Cellular Vagina which accompanies all their Ramifications, and is a continuation of the Interlobular Cells, or Cellular Subſtance in the Interſtices of the Lobuli. The Pelliculæ which compoſe it are, however, diſpoſed there, in a more regular manner, and more longitudinally than in other places, and thereby appear to form a true Vagina.

143. When we blow through a Pipe introduced ſo far as to touch immediately a Trunk of the Blood-Veſſels or Bronchia, the Air runs at firſt through all the Cells that lie neareſt that Trunk or its Branches; but if we continue to blow, it inſinuates itſelf through the whole Interlobular Subſtance.

*Bronchial Glands.*

144. At the Angle of the firſt Ramification of the Trachea Arteria, we find on both the fore and back ſides, certain ſoft, roundiſh, glandular Bodies, of a bluiſh or blackiſh Colour, and of a Texture partly like that of the Thymus already deſcribed, and partly like that of the Glandula Thyroides, of which hereafter. There are other Glands of the ſame kind at the Origin of each Ramification of the Bronchia, but they decreaſe proportionably in number and ſize. They are fixed immediately to the Bronchia, and covered by the Interlobular Subſtance; and they ſeem to communicate by ſmall Openings with the Cavity of the Bronchia.

145. The Trachea has ſeveral Coats, as has been already obſerved. The outermoſt or common Covering ſurrounds that part of the Trachea which lies in the Thorax; but out of the Thorax, this firſt Coat is derived from the Aponeurotic Expanſions of the Muſcles of the Neck; and it is between this and the following Covering that the Glands already mentioned, are ſituated.

146. The ſecond is a proper Coat, being a continuation of the Cellular Covering of the Lungs; and the Pelliculæ thereof neareſt the Cartilaginous Segments, ſerve them for an external Perichondrium. The third Membrane lies on the inſide, adhering cloſely to the ſame Cartilages, and ſupplying to theſe, the place of an internal Perichondrium.

147. The fourth Membrane is that which compleats the Circumference of the Cartilaginous Circles of the Trachea. It conſiſts chiefly of two Laminæ or Strata, partly Muſcular and partly Tendinous; the external or poſteriour Lamina being made up of Longitudinal Fibres; and the internal

or anteriour, of tranſverſe Fibres. This Membrane is perforated by the ſmall Ducts of the abovementioned Glands, which diſcharge a Fluid when preſſed, and being examined through a Microſcope they appear Veſicular or Folliculous, much like thoſe of the Stomach.

148. The Ligaments between the Cartilaginous Circles are very ſtrong and elaſtic; and each of them is confined to two Cartilages without communicating with any of the reſt; being fixed to the Edges of theſe Cartilages much in the ſame manner as the Intercoſtal Muſcles are inſerted in the Ribs.

149. As the Bronchia penetrate into the Subſtance of the Lungs, they gradually loſe their Cartilages; but the Muſcular Lines or Columnæ of M. *Morgagni* appear as much, and ſometimes more than before. The two Planes abovementioned continue likewiſe to be viſible; and we obſerve very diſtinctly, ſometimes even without a Microſcope, a great many ſmall Holes in the Pedicles of the Lobuli, and Bronchial Veſicles or Cells, which open from within outwards.

150. Respiration is performed by Organs of two kinds, one of which may be looked upon as active, the other as paſſive. The Lungs are of the ſecond kind, and the firſt comprehends chiefly the Diaphragm and Intercoſtal Muſcles. *Uſes.*

151. As ſoon as the Intercoſtal Muſcles begin to contract, the Arches of the Ribs are raiſed together with the Sternum, and placed at a greater diſtance from each other; by which means the Cavity of the Thorax is inlarged on the two lateral and anteriour ſides.

152. At the ſame inſtant the Diaphragm is flatted or brought toward a Plane by two Motions, which are apparently contrary; that is, by the Contraction of the Diaphragm, and the Dilatation of the Ribs in which it is inſerted. The external Surface of the Thorax being thus in a manner increaſed, and the Cavity of the Bronchia being at the ſame time and by the ſame means, leſs reſiſted or preſſed upon; the Ambient Air yields to the external Preſſure, and inſinuates itſelf into all the places where the Preſſure is diminiſhed, that is, into the Aſpera Arteria, and into all the Ramifications of the Bronchia all the way to the Veſicles. This is what is called Inſpiration.

153. This Motion of Inſpiration is inſtantaneous, and ceaſes in a moment by the Relaxation of the Intercoſtal Muſcles; the elaſtic Ligaments and Cartilages of the Ribs bringing them back at the ſame time, to their former Situation. This Motion by which the Ribs are depreſſed and brought nearer each other, is termed Expiration.

154. The Pulmonary Arteries and Veins which accompany the Bronchia, through all their Ramifications, and ſurround the Veſicles, tranſmit the Blood through their narrow Capillary Extremities, and thereby change or modify it, at leaſt in three different manners.

155. The firſt Change or Modification which the Blood undergoes in the Lungs, is to have the Coheſions of its Parts broken, to be attenuated, pounded, and as it were, reduced to Powder. The ſecond is, to be deprived

prived of a certain quantity of Serum, which tranſpires through the Lungs, and is what we commonly call the Breath. The third is to be in a manner reanimated by the Impreſſion of the Air, whether the whole Body of the Air enters the Blood, whether the common Air is only the Vehicle of ſome finer Parts which are conveyed to it, or whether the Air only compreſſes and ſhakes the Blood, as it paſſes round the Bronchial Veſicles in the Reticular Capillary Extremities of the Veſſels.

156. The Cartilages of the Aſpera Arteria and Bronchia ſerve in general to compoſe a Canal, the ſides of which will not ſink in or ſubſide by Compreſſion, but will nevertheleſs yield to certain Preſſures and Impulſes without breaking. As theſe Cartilages are not compleat Circles or Rings, and as their Circumferences are compleated by elaſtic Membranes, they allow of theſe Dilatations and Contractions which modulate the Voice; and as they are connected by elaſtic Ligaments of a conſiderable breadth, the alternate Elongation and Contraction of the Bronchia is facilitated in the Motions of Reſpiration.

157. I ſay nothing here of the Larynx, which is commonly looked upon as the upper part of the Aſpera Arteria, but refer the Deſcription of it to that of the Head, with which it has a particular Connexion in relation to the Tongue; and this I do the more willingly, becauſe I have included in the ſame Treatiſe, all that relates to the Neck, as not furniſhing Matter enough for a particular Section, though in the general Diviſion of the Human Body, it may naturally enough be looked upon as a diſtinct part lying between the Head and the Thorax.

## §. 7. *Œſophagus.*

*Situation and Figure.* 158. The Œſophagus is a Canal partly Muſcular and partly Membranous, ſituated behind the Trachea Arteria, and before the Vertebræ of the Back, from near the middle of the Neck, down to the lower part of the Thorax; from whence it paſſes into the Abdomen through a particular Hole of the ſmall or inferiour Muſcle of the Diaphragm, and ends at the upper Orifice of the Stomach.

*Structure and Coats.* 159. It is made up of ſeveral Coats almoſt in the ſame manner as the Stomach, of which it is the continuation. The firſt Coat, while in the Thorax, is formed only by the Duplicature of the poſteriour part of the Mediaſtinum, and is wanting above the Thorax and in the Neck, where the outer Coat of the Œſophagus is only a continuation of the Cellular Subſtance belonging to the neighbouring parts.

160. The ſecond Coat is Muſcular, being made up of ſeveral Strata of fleſhy Fibres. The outermoſt are moſtly longitudinal; but they are not all continued from one end of the Canal to the other. The following Strata are obliquely tranſverſe, the next to theſe, more tranſverſe, and the innermoſt are turned a little obliquely the contrary way. They croſs each other irregularly in many places, but are neither Spiral nor Annular.

161. The third is termed the Nervous Coat, and is like that of the Stomach and Inteſtines. It is differently folded or plaited according to its length, being much wider than the Muſcular Coat; and it is ſurrounded by a whitiſh, ſoft, fine Filamentary Subſtance like a kind of Cotton, which when ſteep'd in Water, ſwells and grows thicker.

162. The fourth or innermoſt Coat reſembles in ſome meaſure that of the Inteſtines, except that inſtead of the Villi it has ſmall and very ſhort Papillæ. It is folded lengthwiſe like the third Coat; ſo that the Œſophagus when cut acroſs, repreſents one Tube within another. Through the Pores of this Coat, a viſcid Lympha is continually diſcharged.

163. The Œſophagus from its very beginning, turns a little to the left Hand, and naturally runs along the left Extremities of the Cartilages of the Aſpera Arteria. The Thyroide Gland and thoſe which lie behind the middle of the Œſophagus ſhall be deſcribed in another place, and I refer the Pharynx as well as the Larynx to the Deſcription of the Head, for a reaſon that ſhall be given there.

## §. 5. *Ductus Thoracicus.*

164. The Thoracic Duct is a thin tranſparent Canal, which runs up from the Receptaculum Chyli, along the Spina Dorſi, between the Vena Azygos and Aorta as high as the fifth Vertebra of the Back or higher. From thence it paſſes behind the Aorta toward the left Hand, and aſcends behind the left Subclavian Vein, where it terminates in ſome Subjects, by a kind of Veſicula, in others by ſeveral Branches united together, and opens into the backſide of the Subclavian Vein near the outſide of the internal Jugular.

165. This Canal is plentifully furniſhed with Semilunar Valves turned upward. Its Opening into the Subclavian Vein in the Human Body, is, in the place of Valves, covered by ſeveral Pelliculæ ſo diſpoſed as to permit the entrance of the Chyle into the Vein, and hinder the Blood from running into the Duct. It is ſometimes double, one lying on each ſide, and ſometimes it is accompanied by Appendices called Pampiniformes.

# SECT. X.

## *A Deſcription of the Head.*

1. IN the Deſcriptions of the Abdomen and Thorax, I began by an account of the External Parts of theſe two Cavities of the Human Body; and afterwards I proceeded to the internal Parts; but I muſt obſerve a different order in deſcribing the Head. I ſhall here explain firſt of all, the Contents of the Cranium or all that lies within that bony Cavity; and afterwards all that ſurrounds it on the outſide; and it is very proper that the Reader ſhould review what has been ſaid concerning the Structure of the Cranium in both Treatiſes of the Bones, before he begins this Section.

2. The Head being conſidered in general as one of the three principal Cavities of the Human Body, has this peculiar to it, that its outſide is the Seat and Baſis of ſeveral very complex particular Organs, whereas on the inſide it contains only one, which is indeed the Organ of Organs, and the Primum Mobile of the whole Animal Œconomy; I mean the Brain, the Mechaniſm of which is ſtill very little known; and the Structure of its different Parts, even of thoſe which we are ſuppoſed to be moſt acquainted with, is very difficult to be demonſtrated.

### ART. I.

### *The Brain and its Appendages.*

3. THE name of Brain is given to all that Maſs which fills the Cavity of the Cranium, and which is immediately ſurrounded by two Membranes called Meninges by the Greeks, and Matres by other Ancients, becauſe they were commonly of Opinion that theſe Membranes were the Origin, and, as it were, the Mother of all the other Membranes of the Body.

4. This general Maſs is divided into three particular Portions; the Cerebrum or Brain properly ſo called, the Cerebellum and Medulla Oblongata. To theſe three Parts contained within the Cranium, a fourth is added which fills the great Canal of the Spina Dorſi by the name of Medulla Spinalis, being a continuation of the Medulla Oblongata.

5. The Meninges or Membranes are two in number, one of which is very ſtrong, and lies contiguous to the Cranium; the other is very thin and immediately touches the Brain. The firſt is named Dura Mater; the ſecond Pia Mater, which is again divided into two, the external Lamina

being termed Arachnoides; the internal retaining the common name of Pia Mater. I begin by theſe Meninges.

### §. 1. *Dura Mater.*

6. The Dura Mater incloſes the Brain and all its Appendages. It lines the inſide of the Cranium, and ſupplies the place of an internal Perioſteum, being ſpread in all the Holes and Depreſſions, and covering all the Eminences in ſuch a manner as to prevent their being hurtful to the Brain. *Situation in general.*

7. In deſcribing the Dura Mater we muſt take notice, 1. Of its Compoſition. 2. Its Adheſions to the Cranium. 3. Its Folds or Septa. 4. Its Productions, Veſſels and Nerves. *Diviſion.*

8. The Dura Mater is made up of two Laminæ, adhering very cloſely together; the Fibres of both, croſſing each other obliquely. By rubbing any part of this Membrane between the Fingers, we eaſily perceive the two Laminæ ſliding a little upon each other. Their Texture is very cloſe and ſtrong, appearing to be partly Ligamentary and partly Tendinous. *Compoſition.*

9. The Dura Mater ſticks cloſely to the Cranium by a great number of Filaments of the external Lamina, which enter the Pores of the Bones chiefly at the Sutures both above and below; and by penetrating theſe Joints, they communicate with the external Perioſteum. Theſe Filaments are for the moſt part, ſmall Veſſels, which being broken in ſeparating the Dura Mater from the Skull, a great number of red Points appear on the external Surface of that Membrane. *Adheſions.*

10. It adheres much more to the whole inner Surface of the Cranium in Children and young Perſons than in thoſe of an advanced Age, the Filaments becoming then very ſmall, being compreſſed by the Contraction of the bony Pores; and conſequently they are more eaſily ruptured by any force applied to them.

11. These Adheſions are formed intirely by the external Lamina. The internal Lamina is very ſmooth and poliſhed on the inſide, which is alſo continually moiſtened by a fine Fluid diſcharged through its Pores, much in the ſame manner as in the Peritonæum and Pleura. *Internal Lamina.*

12. The Folds of the Dura Mater are made by the internal Lamina; and three of them form particular Septa; one of which is ſuperiour, repreſenting a kind of Mediaſtinum between the two great Lobes of the Brain. The ſecond is in a middle Situation, like a Diaphragm between the Cerebrum and Cerebellum; the third is inferiour between the Lobes of the Cerebellum. The ſuperiour Septum is Longitudinal in form of a Scythe, from whence it is termed the Falx of the Dura Mater; and it may likewiſe be called Septum Sagittale, Verticale, or Mediaſtinum Cerebri. The middle Septum is tranſverſe, and might be called the Floor of the Cerebrum, the Diaphragm of the Brain, or the Tent of the Cerebellum. The inferiour Septum is very ſmall, and runs down between the Lobes of the Cerebellum; on which account it may be termed either ſimply Septum Cerebelli, or *Folds and Septa.*

Septum Occipitale Minus; the middle Partition being looked upon as the Septum Occipitale Majus.

13. The Superiour or Vertical Septum called the Falx of the Dura Mater is a long and broad Fold or Duplicature of the internal Lamina, reaching from the Edge of the Criſta Oſſis Cribroſi, along the Sagittal Suture, to the middle of the tranſverſe Septum; which it joins in ſuch a manner, as that the lateral Laminæ of the Falx are contiguous on each ſide, with the neighbouring Portions of the ſuperiour Laminæ of the middle Septum.

14. It is broader where it joins the middle Septum than at the Os Ethmoides, and it is thicker at that Edge which adheres to the Cranium than at the other which lies looſe and is very ſharp, and from this reſemblance to a Scythe it had the name of Falx.

15. The tranſverſe or middle Septum is fixed to the Os Occipitis along the Grooves of the lateral Sinuſes, and thoſe of the great Angles of the Apophyſes Petroſæ all the way to the poſteriour Clinoide Apophyſes of the Os Sphenoidale. By this Situation it forms a ſort of Floor, Tent, or ſhallow Vault, on the forepart of which is a large Notch almoſt of an oval Figure.

16. This Septum divides the Cranium into two Cavities, one large or ſuperiour, and the other ſmall or inferiour, which communicate together by the great oval Notch. It is formed by a particular Fold and a very broad Membrane of the internal Lamina of the Dura Mater; and in the natural ſtate it is very tenſe, becauſe of its Union, or rather Continuity with the Falx.

17. This Union or Continuity of theſe two Septa, keeps them both very tenſe, ſo that the middle Septum is capable of ſuſtaining a conſiderable Weight without ſinking downward; and the Falx is able to reſiſt lateral Preſſures without giving way either to the right Hand or to the left.

18. We may be convinced of this reciprocal Tenſion by firſt touching theſe two Septa in their natural ſtate; and again, after they have been cut one after the other according to their breadth, or rather after having cut in this manner the Falx in one Subject and the tranſverſe Septum in another; for as ſoon as the Falx is cut, the other will be perceived immediately to loſe its Tenſion and Firmneſs; and the ſame thing will be obſerved in the Falx as ſoon as we cut the Septum Medium.

19. The ſmall Occipital Septum is both very ſhort and narrow. It runs down from the middle of the tranſverſe Septum, to the Edge of the great Occipital Hole, being fixed to the internal Spine of the Os Occipitis. It is formed by a Fold and Duplicature of the internal Lamina of the Dura Mater, in the ſame manner as the other two, and diſtinguiſhes the lower part of the Occipital Cavity of the Cranium into two lateral Parts. In ſome Subjects this Septum is double, anſwering to the double Spine of the Os Occipitis.

*Sphenoidal Folds.* 20. Besides theſe large Folds, there are two ſmall lateral ones, on each ſide of the Sella Sphenoidalis, each running from the poſteriour to the anteriour Clynoide Apophyſis on the ſame ſide. Theſe two Folds, together with the anteriour and poſteriour parts of the Sella Sphenoidalis, form a ſmall Foſſula in which the Pituitary Gland is lodged. There are likewiſe two anteriour Folds, at the Edges of the Sphenoidal or Superiour Orbitary Fiſſures, which augment the depth of the middle Foſſulæ of the Baſis Cranii. Thus we have ſeven Folds of the internal Lamina of this Membrane, three large and four ſmall, which may be termed internal Productions or Proceſſes of the Dura Mater.

21. The Elongations of the Dura Mater are Productions of both Laminæ which go beyond the general Circumference and paſs out of the Cranium, through the Openings deſcribed in the Treatiſe of the Skeleton; and in this they differ from the Folds which are formed intirely by one Lamina and do not go out of the Skull. They may be named the external Productions of the Dura Mater. *Elongations.*

22. The moſt conſiderable of theſe Elongations paſſes through the great Occipital Foramen, and runs down the common Canal of the Vertebræ in form of a Tube, lining the inſide of that Canal and incloſing the Medulla Spinalis, by the name of the Dura Mater of that Medulla. The other Elongations accompany the Nerves out of the Cranium in form of Vaginæ, which are more numerous than the Nervous Trunks reckoned in Pairs. For the Olfactory Nerves, there is the ſame number of diſtinct Vaginæ as there are Holes in the Lamina Ethmoidalis; and ſome Nerves are accompanied by ſeveral Vaginæ through one Hole, as thoſe of the ninth Pair.

23. There are two particular Elongations which form the Perioſteum of the Orbits, together with the Vaginæ of the Optic Nerves. Theſe Orbitary Elongations go out by the Sphenoidal or Superiour Orbitary Fiſſures, and increaſing in breadth in their Paſſage, line the whole Cavity of the Orbits, at the Edges of which they communicate with the Pericranium and Perioſteum of the Face. They communicate likewiſe through the Spheno-Maxillary or inferiour Orbitary Fiſſures with the Pericranium of the Temporal and Zygomatic Foſſæ; and by theſe Communications we may explain the accidents which happen to theſe Parts, in Wounds of the Head.

24. The Elongations of the Dura Mater which accompany the Blood-Veſſels through the Foramina of the Cranium, unite with the Pericranium immediately afterwards. Such for inſtance, are the Elongations which line the Foſſulæ of the Foramina Lacera or Jugularia, and the bony or carotid Canals of the Apophyſis Petroſa, &c.

25. The Veſſels of the Dura Mater are Arteries, Veins and Sinuſes. The Arteries in general are diſtinguiſhed into Anteriour, Middle and Poſteriour, and come from the Carotides and Vertebrales on each ſide. The External Carotid ſends a Branch through the Spinal Hole of the Os Sphenoidale, which is the middle Artery of the Dura Mater, and is called by way of Eminence, Arteria Duræ Matris. It is divided into a great number of Branches which are plentifully diſperſed through the Subſtance of the external Lamina as high as the Falx, where theſe Ramifications communicate with their fellows from the other ſide. The Impreſſions of this Artery are *Arteries.*

ſeen on the inſide of the Parietal Bones, the anteriour and lower Angle of which, inſtead of a ſimple Impreſſion, contains a Canal for the Paſſage of a Trunk or Branch of this Artery, on which account ſeveral accidents happen in Fractures of the Skull, as I demonſtrated at the Royal Garden above eight Years ago.

26. The External Carotid ſends another ſmall Ramus through the Corner or ſmall End of the Sphenoidal or Superiour Orbitary Fiſſure, where there is ſometimes a little Notch on purpoſe, mentioned in the Deſcription of the Skeleton. This Branch is the anteriour Artery of the Dura Mater, and it gives off Ramifications in the ſame manner as the former with which it communicates, but its Ramifications are not ſo numerous. The Internal Carotid, as it enters the Cranium, gives off a ſmall Branch to the Subſtance of the Dura Mater.

27. The two Vertebral Arteries enter by the great Occipital Foramen, and unite in one Trunk on the Anteriour or Sphenoidal Apophyſis of the Os Occipitis. Immediately afterwards, they enter the Subſtance of the Dura Mater on both ſides, each of them by one or two Branches. Theſe are the poſteriour Arteries of the Dura Mater; and they communicate by ſome Ramifications with the Middle or Spinal Artery abovementioned.

*Veins and Sinuſes.*

28. The Dura Mater contains in its Duplicature ſeveral particular Canals, into which the Venal Blood not only of that Membrane, but of the whole Brain, is carried. Theſe Canals are termed Sinuſes, and ſome of them are diſpoſed in Pairs, others in uneven numbers, that is, ſome of them are placed alone, in a middle Situation; others are diſpoſed laterally on each ſide of the Brain. The moſt ancient Anatomiſts reckoned only four; to which we can now add four times as many.

29. These Sinuſes are in the Duplicature of the Dura Mater; and their Cavities are lined on the inſide by particular very fine Membranes. They may be enumerated in this manner.

The great Sinus of the Falx or Superiour Longitudinal Sinus, which was reckoned the firſt by the Ancients.

Two great lateral Sinuſes, the ſecond and third of the Ancients.

The Sinus called Torcular Herophili, the fourth of the Ancients.

The ſmall Sinus of the Falx or inferiour Longitudinal Sinus.

The Poſteriour Occipital Sinus, which is ſometimes double.

Two Inferiour Occipital Sinuſes which form a Portion of a Circle, and may likewiſe be called the inferiour Lateral Sinuſes.

Six Sinus Petroſi, three on each ſide, one Anteriour one Middle or Angular, and one Inferiour. The two Inferiour, together with the Occipital Sinuſes, compleat a Circular Sinus round the great Foramen of the Os Occipitis.

The inferiour Tranſverſe Sinus.

The Superiour Tranſverſe Sinus.

Two Circular Sinuſes of the Sella Sphenoidalis; one ſuperiour and one inferiour.

Two Sinus Cavernoſi, one on each ſide.
Two Orbitary Sinuſes, one on each ſide.

30. All theſe Sinuſes communicate with each other, and with the great lateral Sinuſes by which they diſcharge themſelves into the internal Jugular Veins, which are only Continuations of theſe lateral Sinuſes. They likewiſe unload themſelves partly into the Vertebral Veins, which communicate with the ſmall lateral or inferiour Occipital Sinuſes; and partly into the external Jugular Veins, by the Orbitary Sinuſes which communicate with the Venæ Angulares, Frontales, Naſales, Maxillares, &c. as the lateral Sinuſes likewiſe communicate with the Venæ Occipitales, &c.

31. Thus the Blood which is carried to the Dura Mater, &c. by the external and internal Carotid, and by the Vertebral Arteries, is returned to the Heart by the external and internal Jugular and Vertebral Veins; ſo that when the paſſage of the Blood is obſtructed in any particular place, it finds another way, by virtue of theſe Communications, though not with the ſame eaſe. This Obſervation is of conſequence in relation not only to Obſtructions, but to the different Situations of the Head.

32. The great Sinus of the Falx reaches from the Connexion of the Ethmoidal Criſta with the Os Frontis, along the upper Edge of the Falx, all the way to the poſteriour Edge of the tranſverſe Septum, where it ends by a Bifurcation in the great lateral Sinuſes. It is very narrrow at its anteriour Extremity, and from thence becomes gradually wider all the way to its poſteriour Extremity.

33. The Cavity of this Sinus is not Cylindrical but triangular, having in a manner, three ſides, one ſuperiour parallel to the Cranium and two lateral, inclined to the Plane of the Falx. The upper ſide is formed by the external Lamina of the Dura Mater, and through the middle of its breadth a kind of fine Raphe or Suture runs from one end to the other.

34. The two lower or lateral ſides are Productions of the internal Lamina, which having parted from the external, are inclined toward each other, and then unite; forming firſt the Sinus, and afterwards the Duplicature of the Falx. This Sinus is lined interiourly by a fine proper Membrane, which forms likewiſe a kind of Raphe or Suture along the bottom of the Sinus, that is along the union of the two lateral ſides.

35. In this Sinus we obſerve ſeveral Openings and ſeveral Ligamentary Fræna. The Openings are Orifices of Veins, the ſmalleſt of which belong to the Dura Mater, the largeſt to the Brain. The Veins of the Brain enter the Sinus, for the moſt part, obliquely from behind forward, after they have run about a Finger's breadth in the Duplicature of the Dura Mater.

36. It has been thought that the Arteries of the Dura Mater diſcharged themſelves immediately into the Sinuſes, becauſe Injections made by the Arteries or a Hog's Briſtle thruſt into them, have been found to paſs into theſe Sinuſes. But on a more cloſe Examination, it has been diſcovered that the Injections paſſed from the Arteries into the Veins, and from thence

into the Sinuſes, through the ſmall Orifices already mentioned; and that the Hog's Briſtle pierced the ſides of the Artery, which near the Sinuſes are very thin.

37. This miſtake gave riſe to another, that the Dura Mater had no Veins; and what confirmed it was, that the Arteries of the Dura Mater cover the Veins ſo intirely, that the Edges of the Veins are hardly perceivable on either ſide of the Arteries. There are however ſome places where the Veins being broader than the Arteries, their two Edges are ſeen on each ſide of the Arteries like Capillary Veſſels. Theſe Veins are for the moſt part Branches of the Sinuſes, and the ſmall Trunks of ſome of them, open into the Head of the Vena Jugularis Interna. We may eaſily be ſatisfied that the Arteries on both ſides of the Dura Mater communicate with each other above the Falx, either by injecting or blowing into them.

38. The internal Fræna of this great Sinus appear to be Tendinous, and to be deſigned to prevent the too great Dilatation of the Sinus by the Blood. They vary, however, in different Subjects, and do not always reach from one ſide to the other. It has been pretended that Glands have been found there; but we ought to take care not to miſtake for ſuch, certain ſmall Corpuſcles which are the products of Diſeaſes.

39. The inferiour Sinus of the Falx is ſituated in the lower Edge of its Duplicature, being very narrow, and as it were, flatted on both ſides. It communicates immediately with the fourth Sinus of the Ancients; and in ſome Subjects, ſeems even to be a continuation thereof. It likewiſe communicates with the great or ſuperiour Sinus, by ſmall Veins which go from one to the other, and with the Veins of the Cerebrum by the ſame means.

40. The lateral Sinuſes repreſent two large Branches of the ſuperiour longitudinal Sinus, one going to the right Hand the other to the left, along the great Circumference of the tranſverſe Septum, all the way to the Baſis of the Apophyſis Petroſa of the Oſſa Temporum. From thence they run down, having firſt taken a large turn and then a ſmall one; and being ſtrongly fixed in the lateral Grooves of the Baſis Cranii, they follow the courſe thereof all the way to the Foramina Lacera and Foſſulæ of the Jugular Veins.

41. They do not always ariſe by an equal and Symmetrical Bifurcation of the ſuperiour longitudinal Sinus; for in ſome Subjects, one of the lateral Sinuſes appears to be a continuation of the Longitudinal, and the other, to be a Branch from it. This variety may happen on either ſide; and in a word, we ſometimes find one of theſe Sinuſes higher or lower, larger or ſmaller than the other.

42. The Cavity of theſe lateral Sinuſes is likewiſe triangular, and furniſhed with a proper Membrane and with Fræna; and it has alſo the ſmall venal Openings which indeed are common to it, not only with the longitudinal Sinus, but with moſt part of the others. The poſteriour or outer

ſide of this Cavity, is formed by the external Lamina of the Dura Mater, and the other two by the internal Lamina.

43. As theſe two Sinuſes go out by the poſteriour Portions of the Openings of the Baſis Cranii, called Foramina Lacera, they are dilated into a kind of Bag, proportioned to the Foſſulæ of the Venæ Jugulares, where they terminate in theſe Veins.

44. Near the Concourſe of the ſuperiour longitudinal and lateral Sinuſes, we obſerve an Opening (ſometimes double) which is the Orifice of a Sinus ſituated along the Union of the Falx and tranſverſe Septum. It does not always end directly at the lower part of the ſuperiour Sinus, but ſometimes opens at the beginning of one of the lateral Sinuſes, eſpecially when the Bifurcation is not equal; and in this caſe it often terminates in that lateral Sinus, which appears like a Branch from the common Trunk of the ſuperiour and other lateral Sinus.

45. This Sinus has been named Torcular Herophili, from an ancient Author, who imagined that the Blood was in a manner, in a Preſs, at the Union of theſe four Sinuſes. Its Diameter is but ſmall, and it forms a kind of Bifurcation with the inferiour longitudinal Sinus, and with a Vein of the Cerebrum which is ſometimes double, called Vena Magna Galeni.

46. The cavernous or lateral Sinuſes of the Os Sphenoides are Reſervatories of a very particular kind, containing not only Blood, but conſiderable Veſſels and Nerves, as we ſhall ſee hereafter; and likewiſe a ſpungy or cavernous Subſtance full of Blood, much like that of the Spleen or Corpus Cavernoſum of the Urethra.

*Nerves and Glands.*

47. We obſerve ſome Nervous Filaments which go to the Dura Mater, from the Trunk of the fifth Pair, at the entry of the cavernous Sinus; and from the common Trunk of the eighth Pair and Nervus Acceſſorius or Spinalis, as they paſs through the Foramen Lacerum. The ſmall Tubercles ſometimes found on the lateral ſides of the longitudinal Sinus of the Falx, deſerve ſtill to be examined before we can determine any thing about them. The whole inſide of the Dura Mater is moiſtened in the ſame manner as the Peritonæum and Pleura.

48. The prominent Fibres interſecting each other in different manners, which appear on the inſide of the Dura Mater, eſpecially near the Falx and tranſverſe Septum, and which have been taken for a kind of fleſhy Fibres, ſeem to be only Ligamentary and Elaſtic. The univerſal Adheſion of this Membrane to the Cranium, prove that it can have no particular Motion, and conſequently that ſuch fleſhy or muſcular Fibres would be altogether uſeleſs. This Adheſion was plainly demonſtrated by *Veſalius*, *Riolan*, &c. long before *Roonhuyſen*.

## §. 2. *Pia Mater.*

*Situation in general.*

49. This Membrane ſurrounds the whole Maſs of the Brain more particularly than the Dura Mater. It adheres very cloſely to the Brain, and

is connected to the Dura Mater only by the Veins which open into the Sinuſes, as has been already ſaid.

*Structure.* 50. The Pia Mater is made up of two very fine Laminæ, the outermoſt of which covers pretty uniformly, all the convex Surface of the Brain, and lines in the ſame manner all the concave or inner Surface of the Dura Mater. The internal Lamina forms a great number of Plicæ, Duplicatures and Septa, which inſinuate themſelves into all the Folds and Circumvolutions, and between the different Strata of the Cerebrum and Cerebellum.

51. The two Laminæ of the Pia Mater are not ſo cloſely united as thoſe of the Dura Mater, being connected only by a cellulous Subſtance, which accompanies them through their whole extent, except at ſome places of the Baſis of the Cerebrum, &c. where the internal Lamina continuing its Inſertions, the external remains uniformly ſtretched over the prominent Parts, the Interſtices of which are intirely ſeparated from the other Lamina without any cellular Subſtance between them. Theſe ſeparate Portions of the external Lamina have made it be looked upon as a third Membrane of the Brain diſtinct from the Pia Mater; and it has been named Membrana Arachnoides from its reſemblance to a Cobweb in delicacy of Texture.

52. In each of theſe Laminæ of the Pia Mater, we diſcover another kind of fine Duplicature which contains Veſſels, as I have demonſtrated in my private Courſes; but theſe ſmall Veſſels are hardly perceivable without the help of an Injection, or of a great Inflammation. The cellular Subſtance does not only accompany the two Laminæ through their whole common extent, in the manner already ſaid, but alſo the internal Lamina in particular through all its Duplicatures and Septa. This we diſcover by blowing through a ſmall Pipe cautiouſly introduced between the two Laminæ, ſo as not to offend any of the Parts near it, in the manner which I demonſtrated publickly in the Year 1726, in the Diſſections which I performed my ſelf at the Phyſick Schools, after the example of the great *Riolan*.

## §. 3. *Cerebrum.*

*Situation and Figure.* 53. The Cerebrum properly ſo called, is a kind of Medullary Maſs, of a moderate Conſiſtence, and of a greyiſh Colour on the outer Surface, filling all the ſuperiour Portion of the Cavity of the Cranium, or that Portion which lies above the tranſverſe Septum. The upper part of the Cerebrum is of an oval Figure like half an Egg cut lengthwiſe, or rather like two Quarters of an Egg cut lengthwiſe, and parted a little from each other. It is flatter on the lower part, each lateral half of which is divided into three Eminences called Lobes, one anteriour, one middle, and one poſteriour.

*Subſtance.* 54. The Subſtance of the Cerebrum is of two kinds diſtinguiſhed by two different Colours; one part of it which is ſofteſt, being of a greyiſh or Aſh-Colour; the other which is more ſolid, being very white. The

Aſh-coloured Subſtance lies chiefly on the outer part of the Cerebrum like a kind of Cortex, from whence it has been named Subſtantia Corticalis or Cinerea. The white Subſtance occupies the inner part, and is named Subſtantia Medullaris, or ſimply Subſtantia Alba.

*Diviſion and Lobes.* 55. The Cerebrum is divided into two lateral Portions, ſeparated by the Falx, or great longitudinal Septum of the Dura Mater. They are generally termed Hemiſpheres, but they are more like Quarters of an oblong Spheroide. Each of theſe Portions is divided into two Extremities, one anteriour and one poſteriour, which are termed the Lobes of the Cerebrum, between which there is a large inferiour Protuberance which goes by the ſame name; ſo that in each Hemiſphere there are three Lobes, one anteriour, one middle and one poſteriour.

56. The anteriour Lobes lie upon theſe Parts of the Os Frontis which contribute to the Formation of the Orbits and of the Frontal Sinuſes, commonly called the anteriour Foſſæ of the Baſis Cranii. The poſteriour Lobes lie on the tranſverſe Septum; and the middle Lobes in the middle or lateral Foſſæ of the Baſis Cranii.

*Sides and Inequalities.* 57. Each lateral Portion of the Cerebrum has three ſides, one ſuperiour, which is convex, one inferiour, which is uneven, and one lateral, which is flat, and turned to the Falx. Through the whole ſurface of theſe three ſides we ſee Inequalities or Windings like the Circumvolutions of Inteſtines, formed by waving Streaks or Furrows very deep and narrow, into which the Septa or Duplicatures of the Pia Mater inſinuate themſelves, and thereby ſeparate theſe Circumvolutions from each other.

58. Near the Surface of the Cerebrum, theſe Circumvolutions are at ſome diſtance from each other, repreſenting Serpentine Ridges; and in the Interſtices between them, the ſuperficial Veins of the Cerebrum are lodged, between the two Laminæ of the Pia Mater, from whence they paſs into the Duplicature of the Dura Mater, and ſo open into the Sinuſes.

59. These Circumvolutions are fixed through their whole depth to the Septa or Duplicatures of the Pia Mater, by an infinite number of very fine vaſcular Filaments, as may be ſeen by pulling the Circumvolutions a little aſunder with the Fingers.

60. When they are cut tranſverſely, we obſerve that the Subſtantia Alba lies in the middle of each Circumvolution, ſo that there is the ſame number of internal Medullary Circumvolutions as of external Cortical ones; the firſt repreſenting white Laminæ inveſted by others of an Aſh-colour; but the cortical Subſtance is in many places thicker than the medullary.

*Figure.* 61. The anteriour and middle Lobes of the Cerebrum on each ſide are parted by a deep narrow Sulcus, which aſcends obliquely backward, from the Temporal Ala of the Os Sphenoides to near the middle of the Os Parietale; and the two ſides of this Diviſion have each their particular Ridges and Circumvolutions, which gives a very great extent to the cortical Subſtance. This Sulcus is termed Fiſſura Magna Silvii, or ſimply Fiſſura Cerebri.

*Corpus Calloſum.*

62. Having cut off the Falx from the Criſta Galli, and turned it backward; if we ſeparate gently the two lateral Parts or Hemiſpheres of the Cerebrum; we ſee a longitudinal Portion of a white convex Body, which is named Corpus Calloſum. It is a middle Portion of the medullary Subſtance, which under the inferiour Sinus of the Falx, and alſo a little toward each ſide, is parted from the Maſs of the Cerebrum, to which it is ſimply contiguous from one end of that Sinus to the other, ſo that at this place, the Edge of the inſide of each Hemiſphere, only lies on the Corpus Calloſum, much in the ſame manner as the anteriour and poſteriour Lobes lie on the Dura Mater. Both Extremities of this medullary Body terminate by a ſmall Edge bent tranſverſely downward.

63. The Surface of the Corpus Calloſum is covered by the Pia Mater, which runs in between the lateral Portions of this Body, and the lower Edge of each Hemiſphere. Along the middle of its Surface from one end to the other, there is a kind of Raphe formed by a particular Intertexture of Fibres which croſs each other; for though theſe Fibres appear to be tranſverſe, yet they are really a little oblique, and thoſe that come from the right ſide interſect thoſe that come from the left. This Raphe is made more perceivable by two ſmall medullary Cords which accompany it on each ſide, and adhere cloſely to the tranſverſe Fibres.

*Medullary Arch and Centrum Ovale.*

64. The Corpus Calloſum becomes afterwards continuous on each ſide, with the medullary Subſtance, which through all the remaining parts of its extent, is intirely united with the cortical Subſtance, and together with the Corpus Calloſum forms a medullary Arch or Vault of an oblong or oval Figure. To perceive this, the whole cortical Subſtance, together with the medullary Laminæ mixed with it, muſt be cautiouſly and dexterouſly cut off in the ſame Direction with the Convexity of the Cerebrum. After which we will obſerve a medullary Convexity much ſmaller than that which is common to the whole Cerebrum, but of the ſame form; ſo that it appears like a medullary Nucleus of the Cerebrum, eſpecially when we conſider it together with the medullary Subſtance of the inferiour Part or Baſis of the Cerebrum. And from thence *M. Vieuſſens* took occaſion to name this Nucleus the Centrum Ovale.

*Ventriculi Lateralis.*

65. Under this Arch are two lateral Cavities, much longer than they are broad, and very ſhallow, ſeparated by a tranſparent medullary Septum, of which hereafter. Theſe Cavities are generally named the anteriour ſuperiour Ventricles of the Cerebrum, to diſtinguiſh them from two other ſmaller Cavities which are ſituated more backward, as we ſhall ſee preſently; but the name of lateral or great Ventricles given them by *Steno*, is more proper than either of the other two.

66. The lateral Ventricles are broad, and rounded at theſe Extremities which lie next the tranſparent ſeptum. They go from before backward, contracting in breadth, and ſeparating from each other gradually in their progreſs. Afterwards they bend downward, and return obliquely from behind forward in a courſe, like the turning of a Ram's Horn, and termi-

nate almoſt under their ſuperiour Extremities, only a little more backward and outward.

67. At the place where they begin to bend in order to run downward and then backward, there is on each ſide a particular Elongation which runs from before backward, and terminates in a triangular pointed Cavity turned a little inward, the two Points reſembling Horns. Theſe Ventricles are every where lined with a thin Membrane.

*Septum Lucidum.* 68. The tranſparent Partition or Septum Lucidum, as it is commonly called, lies directly under the Raphe or Suture of the Corpus Calloſum, of which it is a Continuation, and a kind of Duplicature. It is made up of two medullary Laminæ, more or leſs ſeparated from each other by a narrow medullary Cavity, ſometimes filled with a ſerous Subſtance. This Cavity in ſome Subjects, reaches a great way backward; and I am apt to think, communicates with the third Ventricle, of which hereafter.

*Fornix.* 69. The Septum Lucidum is united by its lower part, to the anteriour Portion of that particular medullary Body, called improperly the Fornix with three Pillars, becauſe of ſome reſemblance it is thought to bear to the Arches of ancient Vaults. It is in reality nothing but the Corpus Calloſum, the lower ſide of which is like a hollow Cieling with three Angles, one anteriour and two poſteriour; and three Edges, two lateral and one poſteriour. The lateral Edges are terminated each by a large ſemicylindrical Border, like two Arches, which uniting at the anteriour Angle, form by their Union what is called the anteriour Pillar of the Fornix; and as they run backward ſeparately toward the two poſteriour Angles, they have then the name of the poſteriour Pillars.

70. The anteriour Pillar being double is larger than either of the poſteriour; and the Marks of this Duplicity always remain. Immediately below the Baſis of this Pillar, we obſerve a large, white, ſhort, medullary Rope ſtretched tranſverſely between the two Hemiſpheres, and commonly called the anteriour Commiſſure of the Cerebrum. It is to this Pillar that the Septum Lucidum adheres; but it has no total Adheſion below, and therefore the two lateral Ventricles communicate with each other. The poſteriour Pillars are bent downward, and continued through the lower Portions of the Ventricles all the way to their Extremities, reſembling a Ram's Horn, which is a name that has been given to them. They diminiſh gradually in thickneſs during this courſe, and at their outſides they have each a ſmall, thin, flat, collateral Border, to which the name of Corpora Fimbriata is owing.

71. The inferiour Surface of the triangular Cieling which lies between theſe Arches, is full of tranſverſe, prominent, medullary Lines; for which reaſon the Ancients called it Pſalloides and Lyra, comparing it to a ſtringed Inſtrument, ſomething like what is now called a Dulcimer.

*Eminences.* 72. The Fornix being cut off and inverted, or quite removed, we ſee firſt of all a vaſcular Web, called Plexus Choroides, and ſeveral Eminences more or leſs covered by the Expanſion of that Plexus. There are four Pairs of Eminences which follow each other very regularly, two large and two ſmall. The firſt two great Eminences are named Corpora Striata; and the ſecond, Thalami Nervorum Opticorum. The four ſmall Eminences are cloſely united together; the anteriour being called Nates, and the poſteriour Teſtes; but it would be better to call them ſimply, anteriour and poſteriour Tubercles. Immediately before theſe Tubercles there is a ſingle Eminence called Glandula Pinealis.

*Corpora Striata.*

73. The Corpora Striata got that name, becauſe in ſcraping them with the Knife we meet with a great number of white and aſh-coloured Lines alternately diſpoſed, which are only the tranſverſe Section of the medullary and cortical Laminæ, mixed together in a vertical Poſition in the Baſis of the Cerebrum, as appears evidently by Inciſions made from above downward. Theſe two Eminences are of a greyiſh Colour on the Surface, oblong, roundiſh, pyriform, and larger on the fore than on the backpart, where they are narrow and bent.

74. They lie in the bottom of the ſuperiour Cavity of the lateral Ventricles, which they reſemble in ſome meaſure in Shape, their anteriour Parts being near the Septum Lucidum, from which they ſeparate gradually as they run backward and diminiſh in ſize. They are in reality the convex Bottoms of the Ventricles, and it is at the lower part of the Interſtice between the largeſt Portions of them, that we obſerve the great tranſverſe Cord, named the Anteriour Commiſſure of the Cerebrum, which I mentioned already in deſcribing the anteriour Pillar of the Fornix Calloſus. This Cord communicates more particularly with the Bottom of the Corpora Striata, by a turn toward each ſide.

*Thalami Nervorum Opticorum.*

75. The Thalami Nervorum Opticorum are ſo named, becauſe theſe Nerves ariſe chiefly from them. They are two large Eminences placed by the ſide of each other, between the poſteriour Portions or Extremities of the Corpora Striata. Their Figure is Semi-ſpheroidal and a little Oval; and they are of a whitiſh Colour on the Surface; but their inner Subſtance is partly greyiſh and partly white, ſo that in cutting them, we ſee Streaks of different Colours like thoſe of the Corpora Striata.

76. These two Eminences are cloſely joined together, and at their convex part, they are ſo far united as really to become one Body, the whitiſh outer Subſtance being continued uniformly over them both. This Subſtance is very thin, and falls to pieces only by the Weight of the lateral Parts of the Brain when taken out of the Cranium. Therefore to learn the Structure of theſe Eminences, they muſt be examined in Situ, and even there they muſt be handled very gently.

77. Immediately within this whitiſh common Subſtance, theſe two Eminences are cloſely contiguous till about the middle of their thickneſs; and from thence they ſeparate inſenſibly toward the bottom, where by the Space left between them a particular Canal is formed, named the third Ventricle, one Extremity of which opens forward, the other backward, as we ſhall ſee hereafter. Some Anatomiſts have miſtaken the ſuperficial Connexion of theſe Eminences for the Pons Varolii.

78. At the bottom, theſe two Eminences are elongated downward toward both ſides, into two thick, round, whitiſh Cords, which ſeparate from each other like Horns, by a large Curvature, and afterwards by a ſmall Curvature turned forward in an oppoſite Direction to the former, and repreſenting the Tip of an Horn, they approach each other again. The Size of theſe Ropes diminiſhes gradually from their Origin to their anteriour Reunion. I ſhall have occaſion to mention them in another place in ſpeaking of the Optic Nerves.

79. The Tubercles are four in number, two anteriour and two poſteriour; *Tubercula.* adhering together as if they made but one Body ſituated behind the Union of the Thalami Nervorum Opticorum. They are tranſverſely oblong; the anteriour being a little more rounded, and broader or larger from before backward, than the poſteriour. Their Surface is white and their inner Subſtance greyiſh. The Names of Nates and Teſtes given to theſe Tubercles, are very impertinent, there being no reſemblance between them and the things from whence theſe names are taken. I ſhould like to call them Tubercula Quadrigemina; that term being uſed by Anatomiſts on another like occaſion, to expreſs four ſmall Muſcles lying near each other, and inſerted round the great Trochanter of the Os Femoris.

80. Directly under the place where the Tubercles of one ſide are united *Canalis Medius.* to thoſe of the other ſide, lies a ſmall middle Canal, which communicates by its anteriour Opening with the third Ventricle, under the Thalami Nervorum Opticorum, and by its poſteriour Opening, with the fourth Ventricle, which belongs to the Cerebellum, as we ſhall afterwards ſee.

81. Where the convex Parts of the two anteriour Tubercles join theſe *Foramen Commune Poſterius.* poſteriour convex parts of the Thalami Nervorum Opticorum, an Interſtice or Opening is left between theſe four Convexities which communicates with the third Ventricle, and with the ſmall middle Canal. Inſtead of the ridiculous name of Anus which has been given to this Opening, it may be called Foramen Commune Poſterius, to diſtinguiſh it from another which ſhall be mentioned hereafter, by the name of Foramen Commune Anterius.

82. The Glandula Pinealis is a ſmall ſoft greyiſh Body, about the *Glandula Pinealis.* ſize of an ordinary Pea, irregularly round, and ſometimes of the Figure of a Pine Apple, ſituated behind the Thalami Nervorum Opticorum, above the Tubercula Quadrigemina. It is fixed like a ſmall Button to the lower part of the Thalami by two very white medullary Pedunculi, which at the Gland are very near each other, but ſeparate almoſt tranſverſely toward the Thalami.

83. It ſeems to be moſtly of a cortical Subſtance, except near the Footſtalks where it is ſomething medullary. The Footſtalks are ſometimes double, as if they belonged to the two anteriour Tubercles. This Body adheres very cloſe to the Plexus Choroides by which it is covered, as we ſhall ſee hereafter; and it therefore requires ſome Dexterity to ſeparate it from the Glandula, without altering its Situation or breaking the Pedunculi. This Gland has been often found to contain Gravel. Below

the Glandula Pinealis there is a medullary tranſverſe Cord, called the Poſteriour Commiſſure of the Hemiſpheres of the Cerebrum.

*Infundibulum.*

84. Between the Baſis of the anteriour Pillar of the Fornix, and the anteriour part of the Union of the Optic Thalami, lies a Cavity or Foſſula named Infundibulum. It runs down towards the Baſis of the Cerebrum, contracting gradually, and terminates in a ſtreight Courſe, by a ſmall membranous Canal, in a ſoftiſh Body ſituated in the Sella Sphenoidalis, named Glandula Pituitaria. The Infundibulum opens above, immediately before the Optic Thalami, by an oval Hole named Foramen Commune Anterius, and conſequently communicates with the lateral Ventricles.

*The third Ventricle.*

85. At the lower part of the Thalami Nervorum Opticorum directly under their Union, lies a particular natural Canal, called the third Ventricle of the Cerebrum. I call it a natural Canal, that we may not miſtake for it, an accidental Fiſſure which lies between the Thalami in Cerebra taken out of the Cranium, as I have already ſaid.

86. This Canal opens forward into the Infundibulum under the Foramen Commune Anterius, by which it likewiſe communicates with the lateral Ventricles. It opens backward under the Foramen Commune Poſterius, between the Thalami and Tubercula Quadrigemina, oppoſite to the ſmall middle Canal which goes to the Cerebellum.

*Plexus Choroides.*

87. The Plexus Choroides is a very fine vaſcular Texture, conſiſting of a great number of arterial and venal Ramifications, partly collected in two looſe Faſciculi, which lie one in each lateral Ventricle, and partly expanded over the neighbouring Parts, and covering in a particular manner the Thalami Nervorum Opticorum, Glandula Pinealis, Tubercula Quadrigemina, and the other adjacent Parts both of the Cerebrum and Cerebellum, to all which it adheres.

88. In each lateral Portion of this Plexus we obſerve a venal Trunk, the Ramifications of which are ſpread through the whole extent of the two Portions. Near the Glandula Pinealis, theſe two Trunks approach each other, and uniting behind that Gland, they open into the Torcular or fourth Sinus of the Dura Mater. When we blow into one of theſe Trunks toward the Plexus, the Air paſſes into all its Ramifications; and in ſome Subjects, theſe two Veins form one Trunk which opens into the Sinus.

89. The ventricular or looſe Portions of the Plexus, often appear to contain a great number of Tubercles like Glands, which in the natural ſtate are extremely ſmall, but grow bigger in Diſeaſes. To be able to examine them, as we ought, the looſe Portions muſt be made to ſwim in clear Water, and be there carefully expanded. Then by the help of a Microſcope we will ſee theſe Tubercles in the natural ſtate, like ſmall Folliculi or little Bags more or leſs flatted.

90. Besides this vaſcular Web or Plexus of the Septum Lucidum; the ſides of the Fornix, of the Eminences, Ventricles, Canals and Infundibulum, are all covered by a very fine Membrane, in which by Injections or Inflammations, we diſcover a great number of very fine Veſſels. This Membrane is in a manner, a continuation of the Plexus, and that ſeems to

be a detachment from the Pia Mater. By the ſame means we likewiſe diſcover an extremely thin Membrane on the inſides of the Duplicature of the Septum, though in ſome Subjects, theſe ſides touch each other.

*Glandula Pituitaria.*

91. THE Pituitary Gland is a ſmall ſpungy Body lodged in the Sella Sphenoidalis between the ſphenoidal Folds of the Dura Mater. It is of a ſingular kind of Subſtance, which ſeems to be neither Medullary nor Glandular. On the outſide it is partly greyiſh, and partly reddiſh, and white within. It is tranſverſely oval or oblong, and on the lower part in ſome ſubjects it is divided by a ſmall Notch into two Lobes, like a Kidney Bean. It is covered by the Pia Mater as by a Bag, the Opening of which is the Extremity of the Infundibulum, and it is ſurrounded by the ſmall circular Sinuſes which communicate with the Sinus Cavernoſi.

### §. 4. *Cerebellum.*

*Situation and Figure.*

92. THE Cerebellum is contained under the tranſverſe Septum of the Dura Mater. It is broader laterally than on the fore or backſides, flatted on the upper ſide, and gently inclined both ways, anſwerable to the Septum which ſerves it as a kind of Tent or Cieling. On the lower ſide it is rounder, and on the backſide it is divided into two Lobes, ſeparated by the Occipital Septum of the Dura Mater.

*Structure.*

93. IT is made up like the Cerebrum, of two Subſtances, but it has no Circumvolutions on its Surface. Its Sulci are pretty deep, and diſpoſed in ſuch a manner as to form thin flat Strata, more or leſs horizontal, between which the internal Lamina of the Pia Mater inſinuates itſelf by a number of Septa equal to that of the Strata.

94. UNDER the tranſverſe Septum, it is covered by a vaſcular Texture, which communicates with the Plexus Choroides. It has two middle Eminences called Appendices Vermiformes, one anterior and ſuperior which is turned forward, the other poſterior and inferior which goes backward. There are likewiſe two lateral Appendices, both turned outward. They are termed Vermiformes from their reſemblance to a large Portion of an Earthworm.

95. BESIDES the Diviſion of the Cerebellum into lateral Portions or into two Lobes, each of theſe Lobes ſeem to be likewiſe ſubdivided into three Protuberances, one anterior, one middle or lateral, and one poſterior; but they are not in all Subjects equally diſtinguiſhed either by their Convexity or Limits; but they may always be diſtinguiſhed by the Direction of their Strata, thoſe of the middle and anterior Protuberance being leſs tranſverſe than in the poſterior.

*Fourth Ventricle.*

96. WHEN we ſeparate the two lateral Portions or Lobes, having firſt made a pretty deep Inciſion; we diſcover firſt of all the poſterior Portion of the Medulla Oblongata, of which hereafter; and in the poſterior Surface of this Portion, from the Tubercula Quadrigemina, all the way to the poſterior Notch in the Body of the Cerebellum, and a little below

that Notch; we obſerve an oblong Cavity which terminates backward like the Point of a writing Pen. This Cavity is what is called the fourth Ventricle.

97. At the beginning of this Cavity, immediately behind the ſmall common Canal which lies under the Tubercles, we meet with a thin medullary Lamina, which is looked upon as a Valve between that Canal and the fourth Ventricle. A little behind this Lamina, the Cavity grows wider towards both Hands, and then contracts again to its firſt ſize. It is lined interiourly by a thin Membrane, and ſeems oftentimes to be diſtinguiſhed into two lateral Parts, by a kind of ſmall Groove, from the Valvular Lamina to the Point of the Calamus Scriptorius.

98. This Membrane is a Continuation of that which lines the ſmall Canal, the third Ventricle, Infundibulum, and the two great Ventricles. To be able to ſee the fourth Ventricle in its natural ſtate, in which it is narroweſt, it muſt be laid open while the Cerebellum remains in the Cranium, and in order to that, the Os Occipitis muſt be ſawed very low down.

99. On each ſide of this Ventricle the medullary Subſtance forms a Trunk which expands itſelf in form of Laminæ through the cortical Strata. We diſcover theſe medullary Laminæ according to their breadth, by cutting the Cerebellum in Slices almoſt parallel to the Baſis of the Cerebrum; but if we cut one Lobe of the Cerebellum vertically from above downward, the medullary Subſtance will appear to be diſperſed in Ramifications through the cortical Subſtance. Theſe Ramifications have been named Arbor Vitæ, and the two Trunks from whence theſe different Laminæ ariſe, are called Pedunculi Cerebelli.

100. We cannot go on with the deſcription of the other middle parts of the Baſis of the Cerebellum, before that of the middle parts of the Baſis of the Cerebrum, becauſe theſe two kinds of parts are united, and jointly form the Medulla Oblongata. I ſhall only add here that the Strata of both Subſtances of the Cerebellum are not always of the ſame extent in the ſame Portions or Protuberances of each Lobe. This appears meerly by viewing the convex or outer Surface of the Cerebellum; for there we ſee at different diſtances, ſome cortical Strata ſhorter than others, and likewiſe that the Extremities of the ſhort Strata diminiſh gradually in thickneſs till they are quite loſt between two long ones.

101. If we make a ſmall Hole in the external Lamina of the Pia Mater over one of the Lobes of the Cerebellum, without touching the inner Lamina, and then blow into the cellular Subſtance by which theſe two Laminæ are connected, through a ſmall Pipe introduced into the Hole; the Air will gradually ſwell that Subſtance, and ſeparate the Strata more or leſs equally from each other, through their whole extent, and we will ſee at the ſame time the diſpoſition of all the membranous Septa or Duplicatures of the internal Lamina of the Pia Mater, with the numerous diſtribution of the fine Blood-Veſſels which run upon it, eſpecially after a lucky Injection, or in an inflammatory ſtate of theſe Membranes.

### §. 5. *Medulla Oblongata.*

102. The Medulla Oblongata is a medullary Subſtance ſituated from before backward in the middle part of the Baſes of the Cerebrum and Cerebellum without any Diſcontinuation, between the lateral parts of both theſe Baſes; and therefore it may be looked upon as one middle medullary Baſis common to both Cerebrum and Cerebellum, by the reciprocal Continuity of their medullary Subſtances, through the great Notch in the tranſverſe Septum of the Dura Mater; which common Baſis lies immediately on that Portion of the Dura Mater which lines the Baſis of the Cranium. The Medulla Oblongata is therefore juſtly eſteemed to be a third general part of the whole Maſs of the Brain, or as the common Production or united Elongation of the whole medullary Subſtance of the Cerebrum and Cerebellum.

103. It is extremely difficult, if not altogether impoſſible, to examine or demonſtrate it as we ought, in its natural Situation; but we are obliged to do both on a Brain inverted; and in this inſtance, the Direction I gave in the Deſcription of the Skeleton, N° 186, 187. concerning the method of examining and demonſtrating the Baſis Cranii, cannot have place. However to prevent falſe Ideas either in viewing ourſelves, or in ſhewing to others, the Medulla Oblongata thus inverted, it is very neceſſary often to call to mind that all that appears ſuperior in that Situation, is inferior in the natural ſtate.

104. The lower ſide of the Medulla Oblongata in an inverted Situation, preſents to our view ſeveral parts which are in general either medullary Productions, Trunks of Nerves, or Trunks of Blood-Veſſels.

105. The chief medullary Productions are theſe: The large or anterior Branches of the Medulla Oblongata; which have likewiſe been named Crura Anteriora, Femora and Brachia Medullæ Oblongatæ, and Pedunculi Cerebri: The tranſverſe Protuberance called likewiſe Proceſſus Annularis or Pons Varolii: The ſmall or poſterior Branches called Pedunculi Cerebelli or Crura Poſteriora Medullæ Oblongatæ: The Extremity or Cauda of the Medulla Oblongata, with two Pairs of Tubercles, one of which is named Corpora Olivaria, the other Corpora Pyramidalia; and to all theſe Productions we muſt add a Production of the Infundibulum and two medullary Papillæ.

106. The great Branches of the Medulla Oblongata are two very conſiderable medullary Faſciculi, the anterior Extremities of which are ſeparated, and the poſterior united, ſo that taken both together, they repreſent a *Roman* V. Theſe Faſciculi are flat, much broader before than behind; their Surfaces being compoſed of ſeveral longitudinal and diſtinctly prominent medullary Fibres. Their anterior Extremities ſeem to be loſt at the lower part of the Corpora Striata; and it is for that reaſon that they are looked upon as the Pedunculi of the Cerebrum.

107. The tranſverſe, annular, or rather ſemi-annular Protuberance is a medullary Production, which ſeems at firſt ſight to ſurround the poſterior Extremities of the great Branches; but the medullary Subſtance of this Protuberance is in reality intimately mixed with that of the two former. *Varolius* an ancient *Italian* Author, viewing thoſe Parts in an inverted Situation, compared the two Branches to two Rivers, and the Protuberance to a Bridge over them both, and from thence it has the name of Pons Varolii. Its Surface is tranſverſely ſtreaked, and it is divided into two lateral Parts, by a very narrow, longitudinal Depreſſion, which does not penetrate into its Subſtance.

108. The ſmall Branches of the Medulla Oblongata are lateral Productions of the tranſverſe Protuberance, which by their Roots ſeem to incompaſs that medullary Portion in which the fourth Ventricle or Calamus Scriptorius is formed. They form in the Lobes of the Cerebellum on each ſide, theſe medullary Expanſions, a vertical Section of which, ſhews the white Ramifications, commonly called Arbor Vitæ; and they may be juſtly enough ſtiled Pedunculi Cerebelli.

109. The Extremity is no more than the Medulla Oblongata contracted in its Paſſage backward to the anterior Edge of the great Foramen of the Os Occipitis, where it terminates in the Medulla Spinalis; and in this part of it ſeveral things are to be taken notice of. We ſee firſt of all, four Eminences, two named Corpora Olivaria, and the other two Corpora Pyramidalia. Immediately afterwards, it is divided into two lateral Portions by two narrow Grooves, one on the upper ſide, the other on the lower. They both run into the Subſtance of the Medulla, as between two Cylinders, flatted on that ſide by which they are joined together.

110. When we ſeparate theſe Ridges with the Fingers, we obſerve a crucial Intertexture of ſeveral ſmall medullary Cords which go obliquely from the Subſtance of one lateral Portion into the Subſtance of the other. *M. Petit* Member of the Royal Academy of Sciences and Doctor of Phyſick, is the Author of this diſcovery, by which we are enabled to explain ſeveral Phænomena both in Phyſiology and Pathology, of which in another place.

111. The Corpora Olivaria and Pyramidalia are whitiſh Eminences ſituated longitudinally near each other on the lower ſide of the Extremity or Cauda, immediately behind the tranſverſe or annular Protuberances. The Corpora Olivaria are in the middle, ſo that the Interſtice between them, which is only a kind of ſuperficial Groove, anſwers to the inferior Groove of the following Portion.

112. The Corpora Pyramidalia are two lateral Eminences depending on the Olivaria. *Willis* gave the name of Pyramidalia to what I have called Olivaria, after the late *M. Duverney* in his Treatiſe of the Organ of Hearing. Theſe four Eminences are ſituated on the lower half of the Medulla; which Obſervation I here repeat to make it be remembered, that in all the Figures and Demonſtrations, theſe Parts are repreſented as ſuperior,

rior, which in their natural Situation are inferior. Thus theſe Eminences are under the fourth Ventricle, and under the Pedunculi Cerebelli.

113. The Tubercula Mammillaria which are ſituated very near the Production of the Infundibulum, have been taken for Glands, probably becauſe of their greyiſh inner Subſtance, which however does not ſeem to be any ways different from that of ſeveral other Eminences of the Medulla Oblongata. And for that reaſon I chooſe rather to call them from their Figure Tubercula Mammillaria, than Papillæ Medullares.

114. These Tubercles ſeem to have ſome immediate relation to the Roots or Baſes of the anterior Pillar of the Fornix; ſo that they might be named, as *M. Santorini* has done, the Bulbs of theſe Roots, though they appear to be likewiſe partly a Continuation of other Portions of the cortical and medullary Subſtance, of a particular Texture.

115. The Beak or Tube of the Infundibulum is a very thin Production from the ſides of that Cavity; and it is ſtrengthened by a particular Coat given to it by the Pia Mater. It is bent a little from behind forward, toward the Glandula Pinealis, and afterwards expands again round this Gland.

116. The Membrana Arachnoides or external Lamina of the Pia Mater appears to be very diſtinctly ſeparated from the internal Lamina, in the Interſtices between all theſe Eminences on the lower ſide of the Medulla Oblongata, without any viſible cellular Subſtance between them. The internal Lamina adheres much more to the Surface of theſe Interſtices than to that of the Eminences. The external Lamina is as it were buoy'd up by the Eminences, and equally ſtretched between their moſt prominent Parts, to which it ſticks very cloſe; and in this reſpect, the Roots or great Cornua of the Optic Nerves may be joined to theſe Eminences.

117. We muſt obſerve in general concerning the Eminences of the Medulla Oblongata, that thoſe which are medullary on their Outſides or Surfaces, are interiourly either intirely Cortical, or partly Cortical, and partly Medullary, or formed by a ſingular Mixture of theſe two Subſtances, which ſtill remains to be unfolded, as well as many other particularities obſervable in examining the internal Structure of the Brain.

118. From this common Portion of the Cerebrum and Cerebellum, ariſe almoſt all the Nerves which go out of the Cranium through the different Foramina by which its Baſis is perforated. It likewiſe producs the Medulla Spinalis, which is no more than a common Elongation of the Cerebrum and Cerebellum, and of their different Subſtances; and therefore the Medulla Oblongata may juſtly be ſaid to be the firſt Origin or primitive Source of all the Nerves, which go out through the Spina Dorſi, and conſequently of all the Nerves of the Human Body.

### §. 6. *Medulla Spinalis.*

119. THE Medulla Spinalis is only an Elongation of the Extremity of the Medulla Oblongata; and it has its name from its being contained in the bony Canal of the Spina Dorſi. It is conſequently a Continuation or common Appendix of the Cerebrum and Cerebellum, as well becauſe of the two Subſtances of which it is compoſed, as becauſe of the Membranes by which it is inveſted.

120. IN the Deſcription of the Freſh Bones N° 316, 317, 318, 319, I mentioned a Ligamentary Tube which lines the inner Surface of this bony Canal from the great Occipital Foramen, to the Os Sacrum, repreſenting a very long flexible Funnel. I likewiſe mentioned the yellowiſh and very elaſtic Ligaments that lie in the great poſterior Notches of all the Vertebræ, and adhere very cloſely to the Ligamentary Tube.

121. THE Dura Mater, after it has lined the whole internal Surface of the Cranium, goes out by the great Occipital Foramen, and forms a kind of Funnel, in its Progreſs downward thro' the bony Canal of the Vertebræ. As it goes out at the Occipital Hole, it joins the beginning of the Ligamentary Funnel already mentioned, and adheres very ſtrongly to it. That Portion of the Pericranium which terminates exteriourly at the Edge of the great Foramen, joins the Funnel likewiſe; which by all theſe Acceſſions becomes very ſtrong and capable of reſiſting the greateſt Violences.

122. THIS Adheſion of the Dura Mater to the Ligamentary Funnel, is gradually diſcontinued below the firſt Vertebra, and from thence the Dura Mater forms a ſeparate Tube, which runs down in the bony Canal all the way to the Os Sacrum, the Capacity of it anſwering to that of the Canal; but it does not adhere cloſely to the Sides as it does to that of the Cranium. It is ſurrounded by a ſlimy Subſtance, which near the lower end of the Canal, reſembles Fat.

123. THE Spinal Marrow is made up of a cortical and medullary Subſtance, as the Cerebrum and Cerebellum, but with this difference, that the Aſh-coloured Subſtance lies within the other; and in a tranſverſe Section of this Medulla the inner Subſtance appears to be of the Figure of an Horſe-ſhoe or of the Os Hyoides; the convex ſide being turned forward, and the Extremities or Cauda backward.

124. THE Body of the Medulla Spinalis runs down all the way to the firſt Vertebra of the Loins, where it terminates in a Point. The ſize of it is proportionable to that of the bony Canal, ſo that it is larger in the Vertebræ of the Neck than in thoſe of the Back. It is a little flatted on the fore and backſides; ſo that we may diſtinguiſh in it two ſides, one Anterior, the other Poſterior, and two Edges. It is likewiſe in a manner divided into two lateral Halves by a Groove, which runs along the middle of each ſide, being a Continuation of thoſe in the Extremity of the Medulla Oblongata.

125.

125. Each lateral Portion ſends off from both the fore and backſides, between the Grooves and the Edges, at different diſtances, flat Faſciculi of Nervous Filaments turned toward the neareſt Edge. The anterior and poſterior Faſciculi having got a little beyond the Edge of the Medulla, unite in Pairs, and form on each ſide a kind of Knots, called Ganglions by Anatomiſts, each of which produces a nervous Trunk. Theſe Ganglions are made up of a Mixture of cortical and medullary Subſtance, accompanied by a great number of ſmall Blood-Veſſels.

126. The Dura Mater which inveſts the Medulla ſends out on each ſide, the ſame number of Vaginæ, as there are Ganglions and Nervous Trunks. Theſe Vaginæ are Productions of the external Lamina, the internal Lamina which is very ſmooth and poliſhed on the inſide, being perforated by two ſmall Holes very near each other, where each Vagina goes off, through which Holes the Extremities of each anterior and poſterior Faſciculus are tranſmitted; and immediately after their Paſſage through the internal Lamina, they unite.

127. The Triangular Spaces left between the anterior and poſterior Faſciculi and Edge of the Medulla, are filled from one Extremity to the other by an indented Ligament, very thin and ſhining, having the ſame number of Indentations as there are Pairs of Faſciculi. It is fixed at different Diſtances to the Edge of the Medulla, from whence it ſends Filaments to the internal Lamina of the Dura Mater, by which the anterior Faſciculi are diſtinguiſhed from the poſterior.

128. The Membrana Arachnoides is here very diſtinct from the internal Lamina of the Pia Mater; ſo that by blowing through a Hole made in the Arachnoides, it will ſwell from one end to the other, like a tranſparent Gut. The internal Lamina, called in this place ſimply the Pia Mater, adheres very cloſely to the Medulla Spinalis, and ſends many Productions and Septa through its Subſtance. When we blow through a Hole made in the Pia Mater, through the Subſtance of one lateral Portion of the Medulla, the Air penetrates through the whole, and the Pia Mater which covers the other lateral Portion, is ſeparated from it.

129. The Membrana Arachnoides adheres more cloſely to the Pia Mater at the lower than at the upper part, being in a manner ſuſpended by the indented Ligament which runs along both Edges of the Medulla, and is fixed by a Filament to the internal Lamina of the Dura Mater in each Interſtice between the Nervous Faſciculi, as has been already ſaid. It alſo gives off Elongations in the ſame manner as the Dura Mater to each Nervous Trunk or Rope, as we ſhall ſee hereafter.

## §. 7. *The Nerves of both Medullæ, from their Origin to their going out of the Cranium.*

130. I obſerved in the beginning of the Deſcription of the Nerves, that they ariſe either from the Medulla Oblongata or Spinalis; that they go out in Faſciculi diſpoſed in Pairs; that ten Pairs are reckoned to belong to the Medulla Oblongata, of which nine go out through the Foramina of

the Cranium, and the tenth ariſes from the Extremity of this Medulla as it paſſes through the great Occipital Hole; and laſtly, that about thirty Pairs were reckoned to belong to the Medulla Spinalis, of which ſeven paſs through the lateral Notches of the Vertebræ Cervicis, twelve through thoſe of the Back, five through thoſe of the Loins, and five or ſix through the anterior Holes of the Os Sacrum, and one at the ſides of the Os Coccygis.

131. My deſign is here principally to mention ſome particular Obſervations about the Nerves, while they remain within the Cranium, the reſt of their Courſe through the whole Body being already ſufficiently deſcribed; and I beg the Reader firſt of all to review the Idea I gave in that Deſcription, of the general Diviſion and original Diſpoſition of all the Nerves which come either from the Medulla Oblongata or Spinalis.

*Nerves of the Medulla Oblongata.*

132. The firſt Pair of Nerves that ariſe from the Medulla Oblongata are the Olfactory, anciently called Proceſſus Mamillares. Theſe are two very flat and ſoft medullary Ropes, each ariſing firſt by medullary Fibres from the outſide of the lower part of the Corpora Striata, between the anterior and middle Lobe on each ſide of the Cerebrum, and afterwards by another Filament more internally, and by a third which is more poſterior and very long. They run under the anterior Lobes of the Cerebrum, being lodged in two ſuperficial Grooves in the Baſis of theſe Lobes, and lying immediately on the Dura Mater, from the Clinoide Apophyſes to the Os Ethmoides.

133. They are firſt of all conſiderably incurvated from without inwards or toward each other, and having reached near the backſide of the Os Ethmoides, they run for a ſmall Space, parallel to and at ſome diſtance from each other. Backward they are very thin, but they gradually increaſe in bulk in their courſe forward, toward each ſide of the Criſta of the Ethmoidal Bone, where they terminate in elongated Papillæ, the Subſtance of which appears to be ſofter and leſs white than that of the Ropes.

134. These Papillæ lie on the two ſides of the Lamina Cribroſa, and ſend down a nervous Filament into each Hole of that Lamina. At the ſame place, the Dura Mater ſends off the ſame number of Vaginæ which inveſt and accompany the nervous Filaments and their Ramifications on the internal parts of the Noſe.

135. I have already related the Origin of the ſecond Pair or Optic Nerves, from the Eminences called Thalami Nervorum Opticorum; and I have deſcribed their great Curvature, and traced them all the way to their Reunion, which happens immediately before the ſuperior part of the Glandula Pituitaria, and conſequently before the Beak or Production of the Infundibulum. The internal Carotids run upon the outſides of theſe Nerves, immediately after their union, and before they paſs through the Foramina Optica.

136. Besides their Origin from the Optic Thalami, theſe Nerves have likewiſe a kind of Communication with the Tubercula Quadrigemina Anteriora by very fine Filaments, one Extremity of which is loſt in the Tubercles,

bercles, the other in the Roots of the great Arches or Bodies of the Optic Nerves. The internal Structure of theſe Nerves ſeem to change at their entrance into the Optic Holes, as we ſhall ſee in another place.

137. The Union of theſe Nerves by the ſmall Curvatures of their Cornua, is very difficult to be unfolded in Human Bodies. This Union is commonly found to be very cloſe, but in ſome Subjects, it ſeems to be no more than a ſtrong Adheſion, in others, to be partly made by an Interſection or Croſſing of Fibres. They have been found quite ſeparate; and in other Subjects one of them has been obſerved to be very much altered both in Size and Colour through its whole Paſſage, the other remaining in its natural ſtate.

138. The third Pair called Nervi Motores Oculi Communes, Oculares Communes, and Oculo-Muſculares, ariſe from the Union of the anterior Edge of the great tranſverſe Protuberance, with the two great Branches of the Medulla Oblongata. They pierce the Dura Mater behind the lateral Parts of the poſterior Apophyſis of the Sella Sphenoidalis, and paſs afterwards each in the neighbouring Sinus Cavernoſi, by the ſide of the carotid Artery, and all the way to the broad Portion of the ſuperior Orbitary Fiſſure, where they are divided in the manner already ſaid in deſcribing the Nerves.

139. The fourth Pair called Nervi Trochleares, Muſculares Obliqui Superiores, and moſt commonly Pathetici, are very ſmall and tender, and in proportion, very long. They ariſe each behind the Tubercula Quadrigemina, and from the lateral part of the Valviform Expanſion at the entry of the fourth Ventricle. From thence they take their courſe forward all the way to the Edge of the anterior Extremities of the Tranſverſe Sinus, where on each ſide they enter the Duplicature of the Dura Mater, and advancing into the Sinus Cavernoſi, they accompany the third Pair to the ſuperior Orbitary Fiſſure.

140. The fifth Pair called Nervi Innominati, or Trigemini, are at firſt large Trunks ariſing chiefly from the lateral and poſterior Parts of the great tranſverſe Protuberance, and a little from the Corpora Olivaria and Pyramidalia. They run down obliquely forward on the Extremity of the upper or anterior ſide of the Apophyſis Petroſa, very near the ſide of the Sella Sphenoidalis, where they enter the Duplicature of the Dura Mater and Sinus Cavernoſi.

141. At their entry into the Sinus, they form a kind of flat irregular Ganglion, from which ſome Filaments are ſent off to the Dura Mater; and immediately afterward, each of them is divided into three great Branches, one Superior or Anterior, one Middle, and one Inferior or Poſterior. The firſt Branch which may be termed Ocularis or Opthalmicus, accompanies the Nerves of the third and fourth Pairs, to the ſuperior Orbitary Fiſſure. The ſecond called Maxillaris Superior, goes out by the ſuperior maxillary Hole; and the third named Maxillaris Inferior, by the inferior maxillary Hole. As the great Trunk of this Nerve runs down, it perforates the Membrana Arachnoides, which at this place forms a kind of Cieling.

142. The ſixth Pair named Motores Oculorum Externi, Oculares or Opthalmici Externi, and Oculo-Muſculares Externi, are ſmall Nerves, but ſtill not ſo ſmall as the fourth Pair; and I have ſometimes found them double. They ariſe partly from the oblong inferior Eminences, immediately behind the tranſverſe Protuberance, and partly from this Protuberance; and paſſing immediately under it, they pierce the Dura Mater behind the Occipital Symphyſis of the Sphenoidal Bone.

143. They run on each ſide in the Duplicature of the Dura Mater to the Cavernous Sinus; and having entered that Sinus, each of them accompanies the firſt Branch of the fifth Pair to the Superior Orbitary Fiſſure. In this Courſe they communicate with the firſt Branch juſt mentioned, and are increaſed on the forepart by a Filament or two, which ariſe from the great Sympathetic Nerve, and run up with the Carotid.

144. The ſeventh Pair, named Auditorii, ariſe from the lateral and poſterior Part of the tranſverſe Protuberance, near the Pedunculi of the Cerebellum, by two Cords, one ſmall and ſolid, the other large and ſoft, which from thence is called Portio Mollis, and the firſt, Portio Dura, or as I have named it, Nervus Sympatheticus Minimus. The two Nerves on each ſide accompany each other very cloſely, all the way to the internal Foramen Auditorum.

145. The eighth Pair, named Par Vagum, Nervi Vagi, or Sympathetici Medii, ariſe from the poſterior Extremities of the large Branches or Crura of the Medulla Oblongata, from the tranſverſe Protuberance, and from the anterior Part of the inferior oblong Eminences behind the tranſverſe Protuberances; by numerous Filaments, which altogether make a broad Band on each ſide, which runs toward the Foramen Lacerum, where it pierces the Dura Mater, and goes out through the anterior Part of that Hole, having been firſt joined by a nervous Potion that runs up from the Medulla Spinalis through the great Occipital Foramen, by the name of Nervus Acceſſorius Octavi Paris, or Nervus Spinalis. This additional Nerve goes out with that of the eighth Pair through the Foramen Lacerum, lying behind it, but diſtinguiſhed from it by a Membranous Septum.

146. The ninth Pair called Nervi Hypogloſſi Externi, Hypogloſſi Majores, and commonly Guſtatorii, ariſe each from the lateral part of the Extremity of the Medulla Oblongata, between the oblong inferior Eminences, by ſeveral Filaments, which uniting together, form commonly two ſmall Ropes on each ſide, which pierce the Dura Mater ſeparately, and preſently afterwards form one Rope, which goes out of the Cranium through the anterior Condyloide Hole.

147. The tenth Pair, called Nervi Sub-Occipitales, ariſe under the ninth Pair, chiefly from the anterior and a little from the lateral Part of the Extremity of the Medulla Oblongata, oppoſite to the poſterior Part of the Condyloide Apophyſis of the Occipital Bone, by a ſingle Plane or Faſciculus of ſmall Filaments which pierce the Dura Mater directly from

within outward, at the ſame place where the Vertebral Arteries perforate it from without inwards.

148. The Nerves formed by the lateral Union of the anterior and poſterior Filaments of the Medulla Spinalis, go out of the bony Canal of the Spina Dorſi, toward each ſide, through the intervertebral Holes, through the anterior Holes of the Os Sacrum, and the lateral Notches of the Os Coccygis; and from thence they have the general Name of Nervi Vertebrales. They are divided in the ſame manner as the Vertebræ, into ſeven Pair of Cervical Nerves, twelve Pair of Dorſal, five Pair of Lumbar, and five or ſix Pair of Nervi Sacri. *Nerves of the Mudulla Spinalis.*

149. I obſerved in the particular Deſcription of the Nerves, that I begin the Enumeration of the Vertebral Nerves by thoſe which go out between the firſt and ſecond Vertebra; and that the Situation of the Dorſal or Coſtal Nerves which are true Intercoſtals, determined me to this Diſpoſition, the firſt Pair of theſe Nerves paſſing between the firſt and ſecond true Ribs.

150. As the Spinal Marrow which furniſhes all theſe Nerves, ſeldom goes lower than the firſt or ſecond Vertebra of the Loins, as I have already ſaid, the Situation of the Faſciculi of Nervous Filaments muſt be different from that of the Holes through which they paſs; and ſeveral of theſe Faſciculi both anterior and poſterior muſt be longer than the reſt. This we find from experience to be the Caſe in the following manner.

151. The Faſciculi of nervous Filaments of the Medulla Spinalis, which produce the Cervical Nerves, run more or leſs tranſverſely toward each ſide from their Origin to their Paſſage through the Intervertebral Holes. The Faſciculi which form the Dorſal Nerves, run a little obliquely downward from their Origin to the Intervertebral Holes; and thoſe which form the Lumbar Nerves, run down more and more longitudinally from the Medulla to the Holes by which they go out.

152. Therefore the Cervical Faſciculi are very ſhort in the Spinal Canal; the Dorſal Faſciculi are longer, and the Faſciculi from the Loins and Os Sacrum very long. It muſt likewiſe be obſerved that the Faſciculi of the four loweſt Pairs of the Cervical Nerves, and firſt Pair of the Dorſal Nerves are broader and more compounded than the following, becauſe the Brachial Nerves are a Continuation of theſe. The Filaments belongimg to the Lumbar Nerves and thoſe of the Os Sacrum, are likewiſe very broad, and made up of numerous Filaments, as being the Roots of the large Nerves which go to the lower Extremities. The Dorſal Filaments are very ſmall.

153. The Cervical and Lumbar Faſciculi are not only broader and made up of more Filaments than the Dorſal, but alſo ſituated much cloſer to each other, the Lumbar Faſciculi being ſtill more ſo than the Cervical, whereas in the Dorſal a conſiderable Interſtice is left between the Faſciculi.

154. These Lumbar Faſciculi from their Origin to the Extremity of the Os Sacrum, form through the whole Canal of the Lumbar Vertebræ

and of the Os Sacrum, a large Bundle of Nervous Ropes called by Anatomiſts, Cauda Equina, becauſe of ſome Reſemblance which it bears to a Horſe's Tail, eſpecially when taken out of the Canal and extended in clear Water.

155. THOUGH the Medulla Spinalis ends at the firſt Vertebra of the Loins, the Vagina of the Dura Mater by which it is inveſted, is continued through the reſt of the bony Canal all the way to the Extremity of the Os Sacrum, and involves the great Bundle or Cauda Equina, the Cords of which pierce it on each ſide nearly oppoſite to the places where they paſs through the Intervertebral Holes, and the anterior Holes of the Os Sacrum, almoſt in the ſame manner as was ſaid above, in deſcribing the general formation of the Vertebral Nerves.

156. THIS Vagina of the Dura Mater being ſeparated from the Canal of the Vertebræ, and the lateral Elongations which ſerve for particular Vaginæ to the Cords, being cut off, it preſently ſhrinks up and contracts in the ſame manner as all the other elaſtick Parts of the Human Body; for inſtance, as an Artery does when cut tranſverſely ſoon after Death. Therefore its true length muſt be taken while it is in Situ, and likewiſe the true Situation of the lateral Elongations.

157. FROM all this a Concluſion may be drawn of great importance, not only in Anatomical and Philoſophical Inquiries, but alſo for underſtanding local Diſeaſes, Wounds, &c. which is, that when we have occaſion to conſider any particular Nerves near the Vertebræ of the Back or Loins, or near the Os Sacrum, we muſt remember that in the Spina Dorſi the Origin of theſe Nerves is not even with their Paſſage out of the Spine; but proportionably higher. If, for inſtance, we enquire about any of the loweſt Nervi Sacri near the Os Coccygis, we muſt not ſtop at the Extremity of the Os Sacrum, but trace its Origin as high as the laſt Vertebra of the Back, or firſt of the Loins.

158. THE Membrane Arachnoides accompanies the original Faſciculi ſeparately, to their Paſſage through the lateral Elongations of the Dura Mater, forming a kind of Duplicature, Breaks, or Diſcontinuations between the Cords which run in the Vagina of the Dura Mater. The internal Lamina of the Pia Mater, or the Pia Mater ſimply, as it is here reckoned, adheres very cloſely both to the Faſciculi and Filaments of which they are compoſed.

159. AMONG the original Productions of the Nerves of the Medulla Spinalis, we ought ſtill to reckon the formation of the Nervi Acceſſorii of the eighth Pair, or of thoſe that I call Sympathetici Medii. They ariſe from the lateral Parts of this Medulla by ſeveral Filaments, about the third or fourth Vertebræ of the Neck, and ſometimes lower. And, if my Memory does not fail me, I once traced them to the middle of the Back. They run up on each ſide between the anterior and poſterior Ranks of the Nervous Faſciculi, increaſing gradually in Size by the Acceſſion of new Filaments from the poſterior Faſciculi.

160. Having reached above the firſt Vertebra of the Neck, they have a kind of Adheſion or Communication with the neighbouring Ganglions of the Nervi Sub-Occipitales, or thoſe of the tenth Pair. Above this Adheſion they receive two Filaments each, from the backſide of the Medulla, and afterwards continue their courſe towards the great Occipital Foramen. As they enter the Cranium, they communicate with the Nerves of the ninth and tenth Pairs; and at the Foramen Lacerum, they join thoſe of the eighth Pair, with which they return out of the Cranium.

161. In the poſterior Part of the Medulla Spinalis, near its lower Extremity, there is in ſome Subjects a longitudinal Depreſſion in which ſeveral tranſverſe Fibres are ſituated, which though I have not examined any further, I thought it proper to mention this Obſervation, as I found it in my Anatomical Common-Place Book.

### §. 8. *Blood-Veſſels of the Brain and Medulla Spinalis.*

*Arteries.*

162. The Arteries which ſupply the Cerebrum, Cerebellum and Medulla Oblongata, come partly from the Carotids which enter the Cranium through the Canals in the Apophyſes Petroſæ of the Oſſa Temporum, and partly from the Vertebrales, which enter by the great Occipital Foramen, and ſend off the Arteriæ Spinales into the Canal of the Spine for the Medulla lodged there.

163. All theſe Arteries are divided into ſeveral Branches which ſend out a great number of Ramifications diſtributed through both Subſtances of the Brain, and through the whole Extent of the Pia Mater. The Dura Mater both of the Cerebrum and Cerebellum has Arteries peculiar to it, which have been already deſcribed.

164. The Internal Carotid on each ſide enters the Cranium by the great Canalis Petroſus, in an angular or winding Courſe, as was obſerved in the Deſcription of the Skeleton. The inner Surface of this Canal is lined by a Production common to the Dura Mater and inferior Pericranium; to which the Artery adheres only by a looſe Filamentary Subſtance, in which the Plexiform Filaments run, that belong to the great Sympathetick Nerve, commonly called the Intercoſtal.

165. Having paſſed through the bony Canal, it immediately bends upward toward a Notch in the Sphenoidal Bone, and through that Notch it enters the Cranium. Immediately after this, it penetrates the Cavernous Sinus on the ſide of the Sella Sphenoidalis, where having formed a third Curvature, it goes out from it, from below, upwards, and is bent a fourth time round the anterior Clinoide Apophyſis, from before backward. By this Courſe it is in a manner bathed in the Blood of the Cavernous Sinus, together with the third, fourth, fifth and ſixth Pairs of Nerves.

166. After this fourth Curvature the internal Carotid having now reached the ſide of the Infundibulum, and conſequently being very near its Fellow, theſe two Arteries communicate ſometimes by a very ſhort tranſverſe arterial Production. At this place each of them divides into two prin-

cipal Branches, one Anterior, the other Poſterior; and ſometimes into three, in which caſe there is a middle Branch between the two former.

167. The Anterior Branch runs firſt of all, forward under the Baſis of the Cerebrum, ſeparating a little from the ſame Branch of the other Carotid. They approach each other again under the Interſtice between the two Olfactory Nerves, communicating by a very ſhort Anaſtomoſis, and ſending ſmall Twigs to that Pair of Nerves. They afterwards ſeparate, being each divided into two or three Rami.

168. The firſt Ramus of the anterior Branch goes to the anterior Lobe of the Cerebrum. The ſecond, which is ſometimes double, is inverted on the Corpus Calloſum to which it gives Ramifications, as alſo to the Falx of the Dura Mater and middle Lobe of the Cerebrum. The third, which is ſometimes a diſtinct Branch, ſometimes only an additional Ramus to the ſecond, goes to the poſterior Lobe of the Cerebrum. This third Ramus is ſometimes ſo conſiderable as to deſerve to be reckoned the middle Branch of the three principal ones.

169. The Poſterior Branch communicates firſt of all with the Vertebral Artery of the ſame ſide, and then is divided into ſeveral Rami on the ſuperficial Circumvolutions of the Cerebrum, and between theſe Circumvolutions all the way to their bottom. The anterior and middle Branches when there are three, diſtributes the ſame kind of Ramifications to the Circumvolutions and to their Interſtices.

170. All theſe different Ramifications run in the Duplicature of the Pia Mater, from which they receive a kind of additional Coats, and the Capillaries being diſtributed upon it in a reticular manner, do afterwards penetrate the cortical and medullary Subſtance, in which laſt they terminate inſenſibly.

171. The Vertebral Arteries enter through the great Occipital Foramen, having firſt pierced on each ſide the Elongations of the Dura Mater at the ſame place where the Sub-Occipital Nerves, or thoſe of the tenth Pair, pierce it, as they go out; the Arteries in this place lying above the Nerves.

172. At their entry into the Cranium they ſend each ſeveral Ramifications to the Cauda of the Medulla Oblongata, and to the Corpora Olivaria and Pyramidalia, which Ramifications are diſtributed on the ſides of the fourth Ventricle, produce the Plexus Choroides, are ſpread on the whole Surface of the Cerebellum, inſinuate themſelves between the Strata, always inveſted by the Duplicature of the Pia Mater, and are at length loſt in both Subſtances of the Cerebellum.

173. Afterwards the two Vertebral Arteries turn toward each other, for the moſt part immediately under the poſterior Edge of the great tranſverſe or ſemi-annular Protuberance of the Medulla Oblongata, where they unite and form one common Trunk. This Trunk paſſes directly from behind forward, under the middle of the great Protuberance, and partly in the middle Groove or convex Surface of that Protuberance, at the anterior Edge of which it terminates.

174. In its paſſage through the Groove, this Trunk ſends off ſeveral ſmall Branches on each ſide, which ſurround tranſverſely the lateral Portions of the Protuberance, being partly lodged in the ſmall lateral Grooves of theſe Portions. Theſe lateral Branches are afterwards diſtributed to the neighbouring Parts of the Cerebrum, Cerebellum and Medulla Oblongata.

175. This common or middle Trunk of the Vertebral Arteries having reached the Edge of the great Protuberance, is divided again into two ſmall Branches, each of which ſoon communicates with the Trunk of the internal Carotid on the ſame ſide. Inſtead of this Bifurcation, the two laſt or moſt anterior lateral Branches, ſend each ſometimes a ſmall Branch forward, which form the Anaſtomoſes with the internal Carotids.

176. The principal Arteries of the Medulla Spinalis, called commonly Arteriæ Spinalis, are two in number, one Anterior and one Poſterior, lodged in the Grooves by which the Medulla is divided into lateral Portions on both ſides. They ariſe from the Vertebral Arteries, a little above the great Occipital Foramen, where theſe Arteries ſend each a ſmall Ramus downward, as ſoon as they enter the Cranium; and having got under the Extremity of the Medulla Oblongata, they ſend off two other Branches backward.

177. The firſt two Branches uniting ſoon after their Origin, form the Arteria Spinalis Anterior, which runs down within the Canal of the Vertebræ along the anterior Groove of the Medulla. The other two ſmall Branches are inverted on the ſides of the Medulla Oblongata, and from thence running backward, they unite much in the ſame manner with the firſt two, and form the Arteria Spinalis Poſterior, which runs down along the poſterior Groove of the Medulla Spinalis.

178. The two Spinal Arteries in their courſe downward along the Medulla, ſend off on each ſide lateral Ramifications, by which they frequently communicate with each other; and likewiſe with the Vertebral Arteries of the Neck, with the Intercoſtals, and ſometimes they are in a manner ſplit for a little way and then unite again.

179. The Veins of the Cerebrum and Cerebellum, &c. may in general be looked upon as Branches not only of the longitudinal Sinus of the Dura Mater, and of the two great lateral Sinuſes, but alſo of all the inferior Sinuſes of that Membrane; in all which Sinuſes the Veins terminate by different Trunks in the manner already ſaid in the Deſcription of the great ſuperior Sinus. Their principal Ramifications accompany all the cortical Circumvolutions of the Cerebrum, and Directions of the Strata of the Cerebellum, running always in the Duplicature of the Pia Mater. The Veins of the Plexus Choroides in general are of the number of theſe already mentioned.

180. The Veins of the Medulla Spinalis are Branches partly of the ſuperior Extremities of the two Vertebral Veins, partly of the two Venal Ropes termed Sinus Venoſi, which run down both ways laterally on the anterior convex ſide of the Production of the Dura Mater, and form at

different Diſtances reciprocal Communications, by ſemi-annular Arches, as by ſo many ſubordinate Sinuſes. The two longitudinal Sinuſes communicate likewiſe in their Paſſage with the Vertebral Veins, in the ſame manner as the neighbouring Arteries.

## §. 9. *Uſes of the Brain, and of its Appendages in general.*

181. We are obliged to the great *Malpighi* for the firſt and beſt Inſtructions concerning the manner of examining the Structure of the Brain, eſpecially that of the two Subſtances of which it is made up, and for putting us in a condition to be able to conjecture ſomething about its Uſes. The Experiments and Obſervations of that illuſtrious and faithful Searcher into Nature, having been repeated by ſeveral excellent Philoſophers, and confirmed by comparative Anatomy, leave us no room to doubt but that the Brain is a Secretory Organ, or as it is called by Anatomiſts, a Gland.

182. It is to no purpoſe to diſpute about Words, when we are agreed as to the things themſelves. Anatomiſts have for many Years paſt underſtood by the word Gland, an Organ fitted to ſeparate ſome particular Fluid from the Maſs of Blood, as univerſally as they mean by the word Muſcle, all ſorts of fleſhy Fibres capable of Contraction; and this laſt Term might be cavilled at and rejected as juſtly as the other.

183. The whole Matter of Secretions muſt be owned to be very obſcure; but it is to be hoped that the Brain and Liver will ſome time or other lead us ſo far from the knowledge of it, as at leaſt to be able to diſtinguiſh Truth from Falſhood.

184. The greyiſh or aſh Colour of the cortical Subſtance is not the effect of a particular mixture of Red and White; at leaſt we have no Experiment to prove it. The Blood indeed gives this Subſtance a ſlight reddiſh caſt; but the aſh Colour which ſeems to be the Characteriſtic of the Structure of theſe Secretory Organs, is not owing to that.

185. We learn from *M. Ruyſch*'s Anatomical Injections, that the cortical Subſtance is chiefly compoſed of Veſſels; that by making theſe Veſſels ſwim in a clear pellucid Liquor, their Extremities repreſent an infinite number of fine Bruſhes or vaſcular Tufts, and that his Injection fills even the ſmalleſt Filaments of theſe Tufts. He tells us likewiſe, that in theſe laſt Filaments the Structure is altered; and that by the Mechaniſm of this change, the Functions attributed to Glands may be performed.

186. But ſtill theſe Injections and Preparations do not unravel the Myſtery; neither is the Exiſtence of theſe Pencils or Tufts ſufficiently demonſtrated; for they are only the laſt Extremities of the ſmall Arteries macerated in Water, or ſome other Liquor, after being injected; and then artfully ſeparated from the other eſſential Parts of the Organ.

187. In the firſt place they are ſeparated from the Venal Extremities which muſt anſwer to theſe Tufts, in what manner ſoever that be brought about. Secondly, they are ſeparated from the membranous Filaments of the Pia Mater, which in the natural ſtate tie theſe arterial Extremities to

each other, and give them a different Diſpoſition from that of Tufts or Pencils. Thirdly, By this Preparation, the arterial Extremities are ſeparated from their Connexions with the medullary Subſtance; which both Experiments and comparative Anatomy ſhew to be fibrous.

188. It is no ways ſurprizing that theſe Capillary Extremities thus ſtript ſhould float looſely and freely when moved in a Fluid, and that they ſhould put on the appearance of Pencils or Tufts, being in this ſtate only the truncated Extremities of ſmall Veſſels. When we conſider theſe Circumſtances attentively, we find our ſelves obliged to return to the ſmall Glandular Bodies and Folliculi, &c. of *Malpighi*, of which in another place; and at the ſame time we muſt acknowledge that *Ruyſch*'s fine Injections have diſcovered theſe minute Bodies to be of a vaſcular Subſtance, the Structure of which we are ſtill ignorant of.

189. In a word, *Malpighi* has diſcovered the glandular Tubercles and Folliculi without deſtroying their natural Connexions. *Ruyſch* has diſcovered a conſiderable part of their Structure by deſtroying their Connexions. We are therefore very much beholden to both theſe illuſtrious Anatomiſts, and it is only by joining their Obſervations to each other, that we can ever be able to form an Idea of the Secretory Organs, which will anſwer all the Phenomena concerning the different Secretions in the Human Body.

190 The infinite number of theſe ſmall Secretory Cluſters, ſtrain or filter the Maſs of Blood carried to them by the numerous Ramifications already mentioned, and ſeparate from it, an exceſſively fine Fluid; the remaining Blood being conveyed back by the ſame number of Venal Extremities, into the Sinuſes of the Dura Mater, and from thence into the Jugular and Vertebral Veins.

191. This ſubtle Fluid commonly called Animal Spirit, Nervous Juice or Liquor of the Nerves, is continually forced into the medullary Fibres of the white Portion of the Cerebrum, Cerebellum, Medulla Oblongata, and Medulla Spinalis; and by the Intervention of theſe Fibres ſupplies and fills the Nerves, which are a continuation of them.

192. All the Nervous Ropes, as they paſs through the Foramina of the Cranium and Vertebræ are accompanied by particular Elongations of the Pia and Dura Mater. Thoſe of the Dura Mater ſerve them for Vaginæ in their paſſage through the bony Openings. Thoſe of the Pia Mater not only accompany and inveſt each nervous Rope, but alſo form internal Septa between all the Filaments of which each Rope conſiſts. It is known from many Experiments, that the Nerves are the primitive or original Organs of all Muſcular Motion and of all Animal Senſation; and that theſe two Functions depend in general on the Brain; but we are ignorant of the nature of this Dependance, and of the particular Uſes of the Medullary Fibres, of the Nervous Fluid, and of the Membranous Productions which accompany the Fibres and Nerves.

193. Neither is there any thing certain in what has been ſaid concerning the Deſign or particular Uſes of the ſuperficial conformation of the

Cerebrum and Cerebellum, or of the different Configuration of their Turnings, Circumvolutions, Eminences, Depreſſions, Expanſions, and various Folds. It may be affirmed in general, that by this Structure the extent of the Secretory Organ of the Nervous Fluid is increaſed very conſiderably, and the particular Functions of each nervous Rope diſtinguiſhed, and likewiſe their general and reciprocal correſpondence, both in regard to the Exquiſiteneſs of the Organs of Senſation, and the Activity of the Organs of Motion.

194. The Falx of the Dura Mater hinders one Portion of the Cerebrum from preſſing on the other, when we lie on one ſide. The tranſverſe Septum ſerves for a Tent to the Cerebellum, and defends it from a mortal Compreſſion which it muſt otherwiſe be liable to from the Cerebrum, eſpecially when we walk or jump.

195. The Septum and Productions of the Pia Mater connect and ſtrengthen all the Circumvolutions, Diviſions and Ridges of the Cerebrum, Cerebellum, &c. and ſuſtain in a general and almoſt incomprehenſible manner all the Branches and Ramifications of the Blood-Veſſels, all the medullary Filaments, and all the Elongations and Ropes that depend on theſe.

## §. 10. *A Diſſertation on the Anatomy of the Brain by* M. Steno, *read in the Aſſembly held at* M. Thevenot's *Houſe in the Year* 1668.

GENTLEMEN,

Instead of promiſing that I ſhall ſatisfy your curioſity in what relates to the Anatomy of the Brain, I begin by publickly and frankly owning that I know nothing of the matter. I wiſh I were the only Perſon under a neceſſity of talking in this manner, becauſe I might in time become acquainted with what others know; and it would be a great bleſſing to Mankind, if this moſt delicate Part, and which is liable to ſo many dangerous Diſeaſes, were as well underſtood as the generality of Anatomiſts and Philoſophers imagine it to be. In this, few imitate the Sincerity of *Silvius*, who never talks poſitively concerning the Brain, though he has been at more pains about it, than any Man that I know. The number of thoſe who think every thing eaſy is infinitely the greateſt; and they give us the Hiſtory of the Brain and Diſpoſition of its Parts with the ſame confidence and aſſurance, as if they had been preſent at the Formation of this ſurpriſing Machine, and had been let into all the Deſigns of the Great Architect. Though the number of theſe poſitive Gentlemen be very great, and though I cannot pretend to anſwer for the Sentiments of all the reſt, I am nevertheleſs very much convinced that they who ſearch for ſolid Knowledge, will find nothing ſatisfactory in all that has been written about the Brain. It is very certain that it is the principal Organ of the Soul, and the Inſtrument by which it works very wonderful Effects. The Soul which imagines it can penetrate into every thing without it; and that nothing in the World can ſet bounds to its Knowledge, is nevertheleſs utterly at a loſs to deſcribe is own Habitation, and is no where more to ſeek than at home. We need only view a Diſſection of that large Maſs, the Brain, to have Ground to bewail our Ignorance. On the very Surface you ſee varieties which deſerve your admiration; but when you would look into its inner Subſtance you are utterly in the dark, being able to ſay nothing more than that there are two Subſtances, one greyiſh the other white, which laſt is continuous with the Nerves diſtributed all over the Body; that the greyiſh Subſtance ſerves in ſome places for a Cortex to the White, and that in other places it ſeparates the white Filaments from each other.

If we are aſked what theſe Subſtances are, in what manner the Nerves are joined in the white Subſtance, or how far their Extremities penetrate into it; all we can do is to own our ignorance, except we be reſolved to increaſe the number of thoſe who prefer the applauſe of the Publick to ſincerity and truth. For, to ſay that the white Subſtance is only an uniform Body like Wax, without any Art concealed in it, would be to think too meanly of this great Maſter-piece of Nature. We are ſure that where-ever there are Fibres in the Body, they always obſerve a certain regular order more or leſs complex in proportion to the Functions for which they are appointed. If this Subſtance is every where Fibrous, as it appears in many places to be, you muſt own that theſe Fibres are diſpoſed in the moſt artful manner; ſince all the diverſity of our Senſations and Motions depends upon them. We admire the contrivance of the Fibres of every Muſcle, and ought ſtill more to admire their diſpoſition in the Brain, where an infinite number of them contained in a very ſmall Space, do each execute their particular Offices without confuſion or diſorder.

The Ventricles or Cavities of the Brain are no leſs unknown than its Subſtance. They who place the Animal Spirits there, think they are as much in the right as they who make them the Receptacles of the Excrements; but they are both equally puzzled, when they are deſired to explain the Origin of theſe Spirits and Excrements. Theſe may come from the Veſſels found in theſe Cavities as well as from the Subſtance of the Brain; and it is equally difficult to determine how they get out.

Among thoſe who place the Animal Spirits in the Ventricles, ſome make them paſs from the anterior to the poſterior Ventricles, there to meet with the Entries of the Nerves, while others affirm that theſe Entries are in the anterior Ventricles. Some imagine that the Excrements of the Brain are contained in the Ventricles, becauſe they think they ſee ſomething like Excrements there; but they own that there is as ready a Paſſage for them from the Brain down to the Medulla, as into the Infundibulum; and ſuppoſing they go into the Infundibulum, they may be carried from thence into the Sinuſes of the Dura Mater, and there is ſome reaſon to believe that they may have an immediate Paſſage into the Eyes, Nares and Mouth.

We are ſtill more uncertain about what relates to the Animal Spirits. Are they Blood, or a particular Subſtance ſeparated from the Chyle by the Glands of the Meſentery? Or may they not be derived from a Lymphatic Serum? Some compare them to Spirit of Wine, and it may be doubted whether they are not the Matter of Light. Our common Diſſections cannot clear up any of theſe difficulties.

THE true manner of diſſecting the Brain is as little known as its Subſtance. I need not mention the method of cutting it into Slices, becauſe it is owned by every Body that nothing can be learned that way. The ſecond method of unfolding all the Plicæ is ſomething more artful; but it only ſhews us the outer Surface of what we want to know, and even that, very imperfectly.

THE third Method of unfolding the Plicæ, and ſeparating the two Subſtances goes no further than the Surface of the Medulla. Theſe three Methods have been differently combined; and they may be ſtill more diverſified according as they are executed longitudinally, tranſverſely, &c.

AS for my own part, it is my Opinion that the true method of Diſſection would be to trace the nervous Filaments through the Subſtance of the Brain, to ſee which way they paſs, and where they end; but this Method is accompanied with ſo many Difficulties, that I know not whether we may hope ever to ſee it executed without a particular manner of preparing. The Subſtance of the Brain is ſo ſoft, and the Fibres ſo tender, that they can hardly be touched without breaking. Since therefore Anatomy has not hitherto arrived to that degree of perfection as to make the true Diſſection of the Brain, let us without flattering ourſelves any longer, freely acknowledge our Ignorance, that we may not firſt deceive our ſelves, and others afterwards, by promiſing to ſhew them the true Structure of this Organ.

I ſhould tire your patience inſtead of entertaining you, were I to mention particularly all the diſputes that have ariſen about the Brain: Books are but too full of them; and therefore I ſhall only relate the principal Miſtakes that ſtill ſubſiſt among Anatomiſts, and which may be corrected by Anatomy; and they may be reduced to theſe Heads. Some pretend to ſhew Parts in the Brain as ſeparate, which are only a Continuation of the ſame Subſtance; and others would perſuade us that theſe Parts touch each other without any Connexion, though they are viſibly joined together by Filaments or Veſſels. Some ſituate the Parts in the manner which is moſt agreeable to the Syſtems they have framed, without conſidering that they are quite otherwiſe ſituated by nature. They ſhew you the Pia Mater, for inſtance, in places where it never was; and do not ſee the Dura Mater in places where it is very viſible; and in caſe of need, they will make the very Subſtance of the Brain paſs for a Membrane.

I HAVE too good an Opinion of Men of Learning in general, to believe that they do this with a Deſign to deceive others; but the Principles which they have eſtabliſhed, and the Method of Diſſection to which they have accuſtomed themſelves, oblige them to it. All Anatomiſts would demonſtrate the Parts the ſame way, if they made uſe of the ſame Method; and therefore we ought not to be ſurpriſed if their Syſtems are very ill founded.

The Ancients were ſo far prepoſſeſſed about the Ventricles as to take the Anterior for the Seat of common Senſe, the Poſterior for the Seat of Memory, that the Judgment which they ſaid was lodged in the middle, might more eaſily reflect on the Ideas which came from either Ventricles. I would only aſk thoſe who are ſtill of the ſame Opinion, to give us the reaſon why we ſhould believe them, for there is nothing ſatisfactory in all that has been hitherto ſaid in favour of it; and as that fine arched Cavity of the third Ventricle where they placed the Throne of Judgment does not ſo much as exiſt, we may eaſily ſee what Judgment is to be pronounced on the reſt of this Syſtem.

*Willis* is the Author of a very ſingular Hypotheſis. He lodges common Senſe in the Corpora Striata, the Imagination in the Corpus Calloſum, and the Memory in the cortical Subſtance: But without being at pains to enter into the detail of his whole Hypotheſis, we need only make the following Remarks upon it. He deſcribes the Corpus Striatum, as having two ſorts of Striæ, one aſcending, the other deſcending; and yet if you ſeparate the cortical from the white Subſtance, you will perceive that the Striæ are all of the ſame Nature, that is, that they are part of the Subſtance of the Corpus Calloſum which runs toward the Medulla Spinalis, parted into different Lamellæ by the Intervention of the aſh-coloured Subſtance.

How can he then be ſure that theſe three Operations are performed in the three Bodies which he pitches upon? Who is able to tell us whether the nervous Fibres begin in the Corpora Striata, or if they paſs through the Corpus Calloſum all the way to the cortical Subſtance? We know ſo little of the Structure of the Corpus Calloſum, that a Man of a tolerable Genius may ſay about it, whatever he pleaſes.

*M. Deſcartes* knew too well how imperfect an Hiſtory we have of the Human Body, to attempt an Expoſition of its true Structure; and accordingly in his *Tractatus de Homine*, his Deſign is only to explain a Machine capable of performing all the Functions done by Man. Some of his Friends have indeed expreſſed themſelves on this Subject differently from him; but it is evident from the beginning of that Work, that he intended no more than what I have ſaid; and in this ſenſe, it may juſtly be ſaid that *M. Deſcartes* has gone beyond all the other Philoſophers. He is the only Perſon who has explained mechanically all the human Actions, and eſpecially thoſe of the Brain. The other Philoſophers deſcribe to us the Human Body itſelf. *M. Deſcartes* ſpeaks only of a Machine, but in ſuch a manner, as to convince us of the inſufficiency of all that had been ſaid before him, and to teach us a Method of inquiring into the uſes of the Parts with the ſame evidence with which he demonſtrates the Parts of his Machine called a Man, which none had done before him.

We muſt not therefore condemn *M. Deſcartes*, though his Syſtem of the Brain ſhould not be found altogether agreeable to experience; his excellent Genius which ſhines no where more than in his *Tractatus de Homine*, caſts a Veil over the Miſtakes of his Hypotheſes, eſpecially ſince even *Veſalius* himſelf and other Anatomiſts of the firſt rank, are not altogether free from ſuch Miſtakes. And ſince we can forgive theſe great Men their Errors, who paſſed the greateſt part of their lives in diſſecting, why ſhould not *Deſcartes* meet with the ſame Indulgence, who has happily imployed his time in other Speculations?

THE reſpect which I and all the World owe to ſuch ſuperior Geniuſes, would have inclined me to continue only to admire this Treatiſe as containing the Deſcription of a fine Machine invented by the Author, if I had not met with ſeveral Perſons who would make us believe that it is a faithful relation of the moſt ſecret Springs of the real Human Body. Since theſe Perſons are not convinced by *Silvius*'s repeated Demonſtrations that *M. Deſcartes*'s Deſcriptions do not agree with what appears in diſſecting the Human Body, I find my ſelf obliged to point out ſome Parts of his Syſtem, without relating the whole, in which they muſt ſee, if they have a mind to be inſtructed, the vaſt difference there is between *Deſcartes*'s imaginary Machine, and the real Machine of the Human Body.

THE Glandula Pinealis has lately been the Subject of the greateſt Diſputes touching the Anatomy of the Brain; but before I enter upon that Matter, or endeavour to determine the place where it lies, I muſt firſt give *Deſcartes*'s own Opinion in his own words, contained in the following Paſſages, to which I have added ſeveral others taken from the ſame Treatiſe, at the end of this Diſcourſe.

"THE Surface of the Glandula Pinealis has a relation to the inner Sur-
"face of the Brain.

"IN the Concavity of the Brain, the Pores are directly oppoſite to thoſe
"of the ſmall Gland.

"THE Spirits run from all ſides of the Gland into the Concavities of
"the Brain.

"THE Gland may perform its Functions, though it be inclined ſoemtimes
"to one ſide, ſometimes to the other.

"THE ſmall Tubes on the Surface of the Concavities are always turned
"to the Gland, and may eaſily be turned toward the different Points of this
"Gland.

FROM all theſe Paſſages, it is certain that he believed the Glandula Pinealis to lie intirely in the Cavities of the Brain. And though in ſome other places, he ſays, that it is ſituated at the entry of theſe Cavities, yet we are not to think that this is contrary to what he advances in the Paſſages here quoted; for as it is but a very ſmall Body, it may lie either at the entry, or in any other place of the Cavities, and yet ſtill be within them, which he declares to be his Opinion in many places.

WE are now to examine whether this Opinion be not contrary to experience. It is very certain that the Baſis of this Gland reaches immediately from the Paſſage of the third Ventricle to the fourth; but the poſterior Part, that is, one half of the Gland, may evidently be perceived to be altogether without the Cavities, by only removing the Cerebellum, and one or both of the Tubercles of the third Pair, with Dexterity and Care;

upon which the poſterior part of the Gland will be brought into view, and yet no Paſſage will appear, by which the Air or any other Fluid can paſs into the Ventricles.

To prove that the anterior Part of the Gland is not in the lateral Cavities, we need only look upon them, after they have been opened either in *Silvius*'s way, or in that of the Ancients; for the Subſtance of the Brain will always be found to lie between theſe lateral Cavities and the Gland. The ſame thing may be demonſtrated without cutting the Subſtance of the Brain, by ſeparating from its Baſis, the Part which contains theſe Cavities; for the Gland will then appear to be ſo far out of the Cavities, that it can have no manner of relation to them, being hindered by the Inſertions by which this Part is fixed to the Baſis. The Ancients knew very well that the Fornix is not continuous with the Baſis of the Brain, but that it forms a third Cavity on its under ſide, and by forcing in Air through the Fiſſure between the Tubercles of the ſecond Pair, we raiſe the Fornix, and thus by breaking the Filaments which connect it to the Baſis, a large Cavity is formed; from whence ſome have imagined that when the Spirits ſwell the Cavities, the Fornix riſes, and that all ſides of the Surface of the Gland are turned toward the Cavities.

I ſay, ſome have imagined this, becauſe though the Fornix be raiſed in the manner already ſaid, only the anterior Surface of the Gland can be turned towards the lateral Cavities; but no preparation whatever can turn the poſterior Surface toward the poſterior Ventricles. But if the Brain has ſuffered no Violence, either in opening the Cranium, forcing in Air, or by any other Method, the Cavity of this third Ventricle will be found very narrow at the middle, and to contain nothing but the great Vein which forms the fourth Sinus and the Glandular Bodies, which accompany this Vein.

I own that behind this Fiſſure, and immediately below its poſterior Opening, there is a Cavity lined on the fore and lateral Parts by that part of the Plexus Choroides which runs up toward the fourth Sinus, and at the back-part, cloſed by the Glandula Pinealis, the anterior Portion of which is perfectly continuous; and when the Fornix is removed, this Cavity remains intire under the firſt, in the Shape of a kind of inverted Horn.

What *Deſcartes* ſays, that the Glandula Pinealis may perform its Functions, though it inclines ſometimes to one ſide, ſometimes to another, Experience ſhews to be groundleſs; becauſe it is ſo hedged in between all the Parts of the Brain, and ſo fixed to them on all ſides, that it cannot be moved in the leaſt without Violence, and without breaking the Fibres by which it is connected. It is eaſy to ſhew likewiſe that *M. Deſcartes* has not repreſented it in its true Situation, which is neither perpendicular, as he repreſents it, nor inclined forward, as other very great Anatomiſts believe; but its Point is always turned toward the Cerebellum, and makes nearly half a right Angle with the Baſis.

The ſuppoſed Connexion of this Gland with the Brain by means of Arteries, is likewiſe groundleſs; for the whole Baſis of the Gland adheres to the Brain, or rather the Subſtance of the Gland is continuous with that of the Brain, though the contrary be affirmed by *Deſcartes*.

THE Hypotheſis of Arteries meeting round the Gland, and from thence running up to the great Euripus, as it is called, is of great moment in *Deſcartes*'s Syſtem, becauſe the ſeparation and motion of the Spirits depend upon it. But if we can believe our Eyes, this is no more than a Collection of Veins from the Corpus Calloſum, from the interior Subſtance of the Brain, from the Plexus Choroides, from different places of the Baſis of the Brain and from the Gland itſelf; the Office of which Veins is to carry back the Blood from the Brain to the Heart, and not to bring it from the Heart to the Brain. Some have thought that *M. Deſcartes* deſigned to carry the Nerves to the Gland, but he never had any ſuch intention.

SUCH of *M. Deſcartes*'s Friends who look upon his Man only as a Machine, will be ſo good as to believe that I do not here ſpeak againſt his Machine, the contrivance of which I have always admired; but as for thoſe who pretend to demonſtrate that *M. Deſcartes*'s Man is made like other Men; Anatomical Obſervations may eaſily convince them that this is a fruitleſs attempt. And if they ſhould plead the ſame Experience on their ſide, we may readily anſwer that there is nothing more common than not to perceive the miſtakes we commit in diſſecting the Brain, as will evidently appear in the Sequel of this Diſſertation.

I deſigned to have mentioned the other Syſtems of the Brain by which the Animal Actions have been accounted for, and the Origin and Compoſition of the Fluids contained in the Brain, been explained; but I conſidered afterwards, that this undertaking requires more application and leiſure than my Journey will allow me.

DISSECTIONS or Preparations being liable to ſo many miſtakes, and Anatomiſts having hitherto too readily formed Syſtems, and moulded theſe ſoft Parts in the manner that was moſt agreeable to each, we cannot be ſurprized to find ſo little exactneſs in their Figures. But this want of accuracy in the Figures is not owing to bad Diſſections only. The ignorance of Drawers has contributed very much, and the difficulty of expreſſing the ſeveral Eminences and Depreſſions of the Parts, and of underſtanding what the Anatomiſts chiefly inſiſt upon, furniſhes them with a never failing excuſe. The beſt Figures of the Brain are thoſe of *Willis*; but even theſe contain a great number of important Miſtakes, and they want many things to perfect them. In the third Figure he repreſents the Superior or Pineal Gland like a round Ball; and conſequently according to this Figure, the Apex of that Gland cannot be ſaid to be turned either forward or backward. Beſides, we ſee here nothing of the Subſtance of the Brain on the foreſide of the Gland, and which goes from one ſide to the other; all which the Figure would make us believe to be annihilated. Behind the Gland, a Space appears on the Baſis of the Brain between the two Tubercles of the third Pair, which in the natural ſtate, has a quite different appearance. The thin Expanſion of the white Subſtance of the Cerebrum, which is continued to the middle of the Cerebellum, where it is very thick, is quite wanting; as alſo the Origin of the Nervi Pathetici which go out from this Expanſion. He likewiſe repreſents the ſecond Pair of Tubercles as diſtinct, which commonly adhere to each other. The underſide of the Fornix appears to be uniform, which is of an uneven and very elegant Structure. When we cut the Corpus Striatum tranſverſely, we ſee Radii very different from what they are exhibited in *Willis*'s eighth Figure. The white Radii appear there to be continuous with the forepart of the Corpus Striatum, which nevertheleſs is of an Aſh-coloured Subſtance, and as it runs in between the white Radii, does not appear in that method of Diſſecting to adhere to any other Body whatever.

In the third Figure the Infundibulum has no reſemblance to Nature. The Nervi Motores Oculorum are ſtreight, and not oblique as they ought to be; neither do we ſee the true Origin of the Filaments of which theſe Nerves are compoſed, from the Baſis of the Brain. The Pons Varolii might have been better and more diſtinctly expreſſed; and the anterior Roots of the Fornix are not ſeparated as in the ſeventh and eighth Figures, but touch each other at the upper part, and form an acute Angle. The Line marked G. G. G. in the ſeventh Figure appears to be a continued Line, though the part between the Roots of the Fornix which is repreſented, has no Connexion with the Extremities; and in the ſame Figure the Glandula Pinealis is connected to the Subſtance of the Brain by two Funiculi. I need ſay nothing of the Figures of *Veſalius*, *Caſſerius*, &c. for ſince theſe which are the lateſt and beſt, are ſo very imperfect, we may eaſily imagine how little regard is to be paid to the others.

I have ſeen but three Figures of *Varolius* which expreſs in a wretched manner, the beſt Obſervations that have ever been publiſhed on the Brain. I do not know whether the Figures of the firſt Edition at *Padua* in 1573, may not be better than thoſe which I have ſeen publiſhed at *Frankfort* in 1591, and again in *Bauhinus*'s Anatomy. Among *Bartholinus*'s Figures, there are three which repreſent the Brain diſſected after *Silvius*'s Method, but the Author himſelf owns that they are faulty. But to paſs over many other Miſtakes in all theſe Figures, there is not one amongſt them which repreſents truly the Situation of the Glandula Pinealis; the Duct of the third Ventricle; the Plexus Choroides; the Ramifications of the Veins contained in the lateral Cavities; the Diſtribution of the Arteries; the Concourſe of the Veins which form the fourth Sinus; or the numerous glandular Bodies lodged there.

From all this you ſee how the Brain has been hitherto diſſected, how little Knowledge has been gained from theſe Methods of Diſſection, and how falſely the Figures repreſent the Parts which they are deſigned for. It is eaſy to conclude from hence how little regard is to be paid to the Syſtems built on theſe bad Foundations, in framing of which the Authors by an unaccountable ſort of Misfortune common to this with all other Arts, have imployed obſcure Terms, Metaphors and Compariſons, all of them ſo ill choſen as to be equally puzzling to thoſe who have made ſome progreſs in this Science, and thoſe who begin to learn it. Beſides, the greateſt number of theſe Terms are ſo low and ſo unworthy of the moſt noble part of the Body of Man, that I am at a loſs whether I ought moſt to wonder at the bad turn of thought of thoſe who firſt made uſe of them, or at the Indolence of their Succeſſors who continue ſtill to retain them. What neceſſity could there be to imploy the words Nates, Teſtes, Anus, Vulva and Penis, which in their common Signification have no relation at all to the Parts expreſſed by them in the Anatomy of the Brain ? And accordingly what one Author calls Nates, another calls Teſtes, &c.

The third Ventricle is a very equivocal Term. The Ancients underſtood by this word, a Cavity under the Fornix which they believed to be ſeparated from the Baſis of the Brain, and they have repreſented it with three Legs, that it might ſupport the Brain which lies upon it. *M. Silvius* calls the third Ventricle a Canal found in the Subſtance of the Baſis of the Brain, between the Infundibulum and the Paſſage which goes under the two poſterior Pairs of the Tubercles of the Brain, towards the fourth Ventricle. Some Anatomiſts having ſeparated the Bodies of this ſecond Pair of Tubercles, take the Space between them, which is owing to their manner of Diſſection, for the third Ventricle, which is conſequently ſometimes the Fiſſure above and ſometimes the Canal below ; and ſome will have it to be the Space between the Fiſſure and Canal, which is likewiſe owing to the Rupture of the Parts already mentioned. We have therefore three third Ventricles, the ſecond of which alone is the true one ; the firſt and third ariſing intirely from the Methods of preparing the Parts. To theſe a fourth third Ventricle might be added, if the ſmall Fiſſure under the Fornix could be looked upon as a Paſſage between the two anterior Ventricles and the fourth. But it is ſo ſmall and ſo full of the Veſſels and Glands of the Plexus Choroides, that I doubt very much whether there can be any Communication that way, between the anterior and poſterior Ventricles, eſpecially ſince *Silvius*'s third Ventricle is ſufficient for that purpoſe, and likewiſe anſwers the Deſign ſo perfectly well, that whatever goes from the lateral to the poſterior Ventricle, muſt firſt of all fill the Infundibulum and this Canal.

Two Glands are reckoned to belong to the Brain, though we know not if either of them reſembles Glands in any thing more than in the Figure, and even that, when well examined, will be found to be different from what it is in the reſt. The Superior or Pineal Gland is not like a Pine-Apple, either in Brutes or in Man ; and it is not known whether the inferior or pituitary Gland acts in any reſpect on the Pituita.

The Plexus Choroides repreſents a vaſcular Texture, in which the Veins are ſeen very diſtinct from the Arteries, and the Diſtribution of each may be traced ſeparately. The name of Fornix gives the Idea of an arched or vaulted Part, which however is not to be found, when looked for in a proper manner. The Corpus Calloſum in the common ſignification means the white Subſtance of the Brain which comes into view when the two lateral Parts are ſeparated ; but as it intirely reſembles the reſt of the Subſtance of the Brain, there can be no reaſon for giving a particular name to one part of this Subſtance.

THERE are but two ways of coming at the knowledge of a Machine, either to be taught the whole Contrivance by the Maker, or to take it quite to pieces, and to examine each Piece by itſelf, and as it ſtands in relation to the reſt. Theſe are the only true ways of learning the Contrivance of any Machine; but the generality of Inquirers have thought that they had better gueſs at it, than be at pains to examine it throughly. They have ſatisfied themſelves with obſerving its Motions, and on theſe Obſervations they have built Syſtems which they believed to be true, becauſe by their help, they imagined they could explain all the Effects which they knew. They never conſidered that the ſame thing may be explained in different manners; and that the Senſes alone are capable of informing us whether our Ideas be conformable to Nature. As the Brain is a Machine, we muſt not flatter ourſelves that we can diſcover the Contrivance of it by any other means than are made uſe of for knowing other Machines; and we have no way left but to take it to pieces, and to conſider what every part is capable of in a ſeparated and in an united ſtate. In this ſearch, we may truly ſay that few Anatomiſts have diſcovered any great degree of Curioſity. Chymiſtry has in all Ages found both private Men and Princes very ready to erect Laboratories; but few have purſued Anatomy with equal Ardor. This neglect is not owing to Princes, among whom, many have had curioſity enough for ſuch an important part of Knowledge, to build magnificent anatomical Theatres, which they have often honoured with their preſence. But the Diſſectors being always willing to appear compleat Maſters of this Science, never have had the ſincerity to own that any thing ſtill remained to be known, and to conceal their Ignorance, have contented themſelves with demonſtrating what is to be found in the Writings of the Ancients.

ANATOMISTS might have reaſon to blame me, if I did not ſhew by a farther explanation that they are not ſo much in the wrong as I ſeem to inſinuate, by ſaying, that they do not apply themſelves ſufficiently to Anatomical Inquiries. They that ſtudy Anatomy are generally either Phyſicians or Surgeons, who being both obliged to viſit their Patients, have too little Time left for Study, after they have attained to a tolerable degree of Reputation. But they ought not to undertake the Cure of a Body, the make of which they do not know, that is, they ought not to endeavour to rectify a Machine till they are previouſly acquainted with its Nature. Others who do not viſit ſick Perſons, and have no other Buſineſs but that of teaching Anatomy in publick Schools, do not look upon themſelves as more obliged to purſue Anatomical Inquiries than the practiſing Phyſicians and Surgeons. The Deſign of their Profeſſion is to teach to thoſe who are to practiſe Phyſick and Surgery, the Deſcriptions left us by the Ancients, of the Structure of the Human Body; and when they have clearly demonſtrated all that is contained in the Works of the Ancients, and their Hearers have as diſtinctly underſtood them, they both imagine that they have done their Duty. The Bounds of theſe different Profeſſions of teaching and practiſing have been ſo very ill ſettled, that the true knowledge of the Human Machine, though the moſt neceſſary Branch, is neglected, as belonging neither to the Anatomiſt, Phyſician, nor Surgeon.

To make the neceſſary Inquiries for the diſcovery of Truth, a Man's whole time muſt be taken up; and Profeſſors of Anatomy, who are obliged to make publick Demonſtrations, which imploy a great deal of time and labour, cannot be proper for this Study, for the reaſons already given, and for the following, which are no leſs evident.

1. There is ſo much Time and Application required to examine each Part as it ought, that every thing elſe muſt be laid aſide, and we muſt mind nothing but that. Phyſicians and Surgeons cannot comply with this becauſe of their Practice; nor Profeſſors, becauſe of their publick Demonſtrations. Whole Years may ſometimes be neceſſary to diſcover what may afterwards be demonſtrated to others in the ſpace of an Hour. I do not queſtion but that *Pecquet* was a great while in carrying the Chyle from the Meſentery to the Subclavian Vein; and perhaps I ſhould not be believed, were I to mention what difficulties I found, before I could ſhew the true Inſertion of *Pecquet*'s Duct, of which *Bilſius* had given us a Figure; whereas at preſent they may be both prepared and demonſtrated in half an Hour.

2. Though Anatomiſts open a thouſand Bodies in the Schools, it is by meer accident if they ever diſcover any thing new. They are obliged to demonſtrate the Parts as deſcribed by the Ancients, and in doing this it is neceſſary they ſhould follow a certain Method; whereas Inquiries admit of no ſettled Method, but muſt be purſued in every manner that can be thought of. In the Schools every thing muſt be removed that lies in the way of the Part which they want to ſhew; but in particular Searches no Part muſt be cut off till we have firſt examined it; and if any ſuch thing were attempted in publick Diſſections, the Demonſtrator would be looked upon as ignorant; and the Spectators would be often in the right to complain of loſs of time, becauſe he would not always be ſure to find what he propoſed to ſhew them. It is evident from theſe Conſiderations that Profeſſors have not hitherto been obliged to make Inquiries in Anatomy, and even that it is impoſſible for them to do it, were they ever ſo willing; ſo that it is not their fault that greater Progreſs has not been made in that Science.

Anatomy in general has, we ſee, been managed hitherto with very little ſucceſs; and the Inquiries into the Brain have ſucceeded leſs than any others, becauſe they have not been made with that care and diligence which the difficulty of the Subject requires. Let us now conſider the true Method, and examine if any Perſon has hitherto found it out.

*Bilſius* applied himſelf to Anatomy, without having ſtudied the Writings of the Ancients, and I make no queſtion but that he would have made a greater Progreſs, if after having learned all that is good in theſe Writings, he had imployed his time and application in making new diſcoveries. We muſt own that the Works of our Predeceſſors contain very fine Experiments,

ments, which we might ſtill have been ignorant of, if they had not handed them down. And they have ſometimes told us Truths, which their Succeſſors, for want of ſufficient application, have not been able to ſee. It muſt, however, be owned, that all that both Ancients and Moderns have told us about the Brain is ſo uncertain, that the Books which contain the Anatomy of this Organ may be ſaid to be chiefly a Collection of Doubts, Diſputes and Controverſies; but ſtill a great advantage may be made of their Labour, and even of their Miſtakes. I here ſpeak of the Authors who have diſſected, for as for thoſe who only copy the Works of others, the beſt that can be ſaid of them is, that it may ſometimes be proper to read their Books by way of Diverſion. But they would have deſerved a great deal more commendation, and been more uſeful to thoſe who diſſect, if they had given us only an exact relation of all that Anatomiſts have wrote about the Brain; if they had explained, according to the laws of a true Analyſis, all the different ways of accounting for the Animal Actions mechanically; or if they had made an exact Liſt of all the Propoſitions found in theſe Writings, diſtinguiſhing thoſe which are founded on Facts and Experience, from thoſe which contain Reaſonings and Concluſions drawn from the former. None of theſe Methods have hitherto been purſued by the Compilers, and therefore we muſt confine ourſelves moſtly to the original Authors.

The firſt thing to be conſidered is the Hiſtory of the Parts; and in this we ought preciſely to determine what is true and certain, that we may be able to diſtinguiſh that, from what is falſe or uncertain. Neither is it ſufficient that we our ſelves are ſatisfied about any thing; the evidence of our Demonſtrations ought to be ſo clear as to oblige every body elſe to aſſent to them, for otherwiſe the number of Diſputes would rather increaſe than diminiſh. Every Anatomiſt who diſſects the Brain demonſtrates from experience what he advances. This ſoft and pliable Subſtance ſo readily yields to every motion of his Hand, that the Parts are imperceptibly formed in the ſame manner as he had conceived them before Diſſection; while the Spectator who often ſees two contrary Experiments made on the ſame Part, is either puzzled very much to know which he ought to embrace, or obliged to reject both to make himſelf eaſy. Therefore to prevent this inconveniency, it is abſolutely neceſſary to carry Diſſections the length of a convincing certainty, which, though very difficult, is very far from being impoſſible. For I would not have you imagine from what I have ſaid, that I believe there is nothing certain in Anatomy; or that all who follow that Study, make the Parts appear as they have a mind, without any danger of being diſcovered. You may indeed juſtly doubt, if Parts which are ſhewn you ſeparated, were ever united; but it would be impoſſible to ſhew them united together, if they were not naturally ſo. To clear up any doubt that might ariſe on this Subject; and to be certain whether the Parts which are ſhewn you were naturally joined or not, you need only examine them in their natural ſtate, without uſing any kind of violence, but allow thoſe whom you have a mind to convince, to do all that is in their power to ſhew that they are united. We may come at the ſame degree of certainty in other Circumſtances, and particularly when we inquire into the Situation of Parts, provided we touch nothing without having firſt examined it, and ſet down every moment what we touch. In order to this we muſt not only be very attentive to the Part which we examine, but alſo reflect on all that we did before we reached it, to ſee if theſe Operations may have changed it from its natural ſtate in any reſpect. For by often handling more exterior Parts, we may eaſily effect thoſe that lie within them, and when theſe come in ſight, we are apt to imagine that they are naturally ſuch as they then appear, without conſidering how far we may have altered their Situation and Connexion with other Parts. The moſt famous Anatomical Diſpute which this Age has produced may ſerve for an example of what I ſay. They who deny the Continuation of the Glandula Pinealis with the Subſtance of the Brain, and the Adheſion of the Fornix to the Baſis of the Brain, would not talk ſo poſitively concerning a matter of fact, if they did not believe it to be proved by inconteſtable Experiments and Obſervations. But in making theſe Experiments they muſt neceſſarily have forgot the changes which happen in ſeparating the exterior Parts, and that they deſtroy all the Connexions by which the Dura Mater adheres to the Cranium; and I have often obſerved that in raiſing the ſuperior Part of the Cranium, the middle of the Dura Mater continued ſtill to adhere to it, even after I had opened it ſufficiently, to thruſt in three Fingers between the ſeparated Parts of the Cranium. Now, how can the Dura Mater be thus raiſed without making the interior Parts to which it is fixed ſuffer violence. The Glandula Pinealis adheres to the fourth Sinus, which is connected with the Falx, ſo that the Dura Mater cannot be raiſed at that place without affecting the Gland. This Falx receives likewiſe all the Veins which paſs between the Fornix and the Baſis of the Brain, and by which theſe two Parts are connected. There is a pretty ſtrong Connexion between the upper part of the Brain and the Dura Mater, and when that Membrane is raiſed, the Brain muſt follow it; and the fourth Sinus being carried upward, breaks the Connexion between the Fornix and the Baſis. I have many times been deceived about this when I firſt began to diſſect the Brain, and I uſed to wonder why theſe Connexions were not always ſenſible. But obſerving afterwards in Horſes, Sheep, Cats, &c. where that part of the Dura Mater which ſeparates the Cerebrum from the Cerebellum is oſſified, that I deſtroyed a great many of the inner Parts in extracting this Bone; I began to perceive the cauſe of this miſtake, and that it was not an eaſy matter to ſeparate the Cranium as it ought. The common way is to divide the Cranium by a circular Section, to remove the upper Segment, but if this Segment were again divided by a Section perpendicular to the former, it would be much more eaſily removed without doing any violence to the Brain; for Sciſſars, Saws and Forceps cannot be handled without ſhaking and diſordering the Parts. A ſmall circular Saw might be contrived which would not ſhake the Parts very much, eſpecially if it were turned upon a proper Axis placed between two pointed Pillars. This Saw might likewiſe be imployed for ſeveral other purpoſes in ſeparating the Cranium; but if any Liquor could be diſcovered to diſſolve or ſoften the Bones in a ſmall ſpace of time, this would be by far the beſt way of ſeparating the Cranium.

It is not ſufficient to be continually attentive, we muſt likewiſe make uſe of different Methods of Diſſection, which are ſo many different proofs of the truth of our Operations, in order to ſatisfy our ſelves and to convince others.

This will appear a very ſtrange Doctrine to thoſe who believe that there are ſtated Laws for the Diſſection of every Part, and that the Anatomical Adminiſtrations taught us by the Ancients, ought to be inviolably obſerved without any change or addition. I own that the Ancients might have given us unalterable Rules for the Diſſection of each Part, had they been ſufficiently acquainted with them themſelves; but as they certainly knew leſs about many Parts than we do, they were at leaſt as unfit as we are, to preſcribe Rules which can never be fixed or conſtant till more Diſcoveries have been made. It will here be objected that ſome method muſt be followed in diſſecting the Parts already known. This I readily grant, and alſo that the Method of the Ancients is to be made uſe of till a better is found out; but I would not have that Method looked upon as perfect or unalterable. The principal reaſon why a great many Anatomiſts have remained in their miſtakes, and why they have gone no greater a length than the Ancients in Diſſection, is becauſe they believe that every thing has been already taken notice of, and that there is nothing left for the Moderns to do; and as they have looked upon the Ancient Laws as inviolable Rules in Diſſection, they ſpent their whole lives in demonſtrating the ſame Parts in the ſame manner; whereas Anatomy ought to be confined by no Rules, every new Diſſection requiring a different Method. The advantage of proceeding in this manner is, that if we miſs of new Diſcoveries, we at leaſt are put in a condition to find out any miſtakes that may have happened in former Diſſections, eſpecially in controverted Points, in which the Spectators ought to have the liberty of preſcribing the Rules of Diſſection.

This method of Diſſection makes indeed but a very ſmall ſhew, and a Man cannot well diſplay his Learning at the ſame time that he acknowledges his Ignorance; but as for my own part I much rather chooſe to own what I do not know, than to impoſe upon my Hearers, ancient Opinions, which will ſome time or other be demonſtrated to be falſe. We have ſeen great Anatomiſts expoſed to this Mortification; and we ſtill ſee many who believe that more regard will be paid to their ſtiffneſs and poſitiveneſs in Opinion than to ocular Demonſtration. I wiſh theſe Gentlemen much joy of their ſelf-conceit; while I endeavour to follow the Laws of Philoſophy by which we are taught to ſearch after Truth in ſo cautious a manner, as never to believe we have found it, till it brings demonſtration along with it.

I cannot prove to you the neceſſity of often changing the Methods of Diſſection better than by the two following Examples. It is a confirmed

Experiment that by blowing into the beginning of the Fiſſure under the Fornix, the Fornix is ſeparated from the Baſis, and a conſiderable Cavity left between them ; and the ſame thing happens when we ſeparate the Cranium with violence, as I have already ſaid. This is ſo evident, that both the Diſſector and the Spectators are fully convinced of it ; but if any Perſon ſhould ſtill be in doubt, there is no other way to clear it up but to endeavour to demonſtrate this Cavity in another manner. For if it be natural, we muſt always find it the ſame, in whatever manner we look for it ; but if by any other Method you find that it is wanting, and that the Parts between which it ought to lie, are connected together without leaving any void Space between them, you ought from that moment to be convinced of the falſity of the former Demonſtration, and that it was the force of the Air to which the appearance of a Cavity was owing.

If the Brain is diſſected according to the Method of *Varolius* or *Willis*, after having taken it out of the Cranium, you will commonly ſee the ſecond Pair of Tubercles ſeparated at the middle of that white Subſtance which lies before the Glandula Pinealis, and which is very often broken. When we make the Diſſection, leaving the Brain in the Cranium, we ſee both the Tubercles and the white Subſtance intire, and then we ſee plainly that the cauſe of the firſt miſtake was owing to the Weight of the lateral Parts which break thoſe in the middle.

Having made a true and exact Plan of the Parts of the Brain ; having diſcovered the Miſtakes and the Cauſes of theſe Miſtakes ; and having ſettled the true Method of demonſtrating theſe Parts, with all the neceſſary Precautions ; the next Step is to expreſs by good Figures all that we have diſcovered ; for we had better be without Figures than not have them true and faithful. When we cannot have recourſe to the Originals, the Repreſentation ſerves to keep us in mind of them ; and many Perſons never have an opportunity of ſeeing the Parts in any other way, their averſion for Blood, hindering them from ſatisfying their curioſity by examining dead Bodies ; and therefore if the Figures are not true, they give falſe Ideas to thoſe who would learn Anatomy by their help, and puzzle others who make uſe of them only to refreſh their Memory.

We ought therefore to leave nothing undone to procure exact Figures ; in order to which a good Drawer is as neceſſary as a good Anatomiſt. We muſt likewiſe apply our ſelves very particularly to ſee in what manner we ought to diſſect and diſpoſe the Parts ſo as to exhibit all that is to be ſeen in the Brain, there being difficulties peculiar to this Organ. The other Parts require only a preparation to compleat the Figures we deſign ; whereas the Brain, never ſo well prepared, ſubſides before the Figure can be taken ; and we muſt have ſeveral freſh Subjects before one Figure can be finiſhed. To this perhaps it is owing that no Anatomical Figures are ſo imperfect as thoſe of the Brain.

I have hitherto ſaid nothing of the Uſes of the Parts nor of the Animal Actions, as they are called, becauſe it is impoſſible to explain the Movements of a Machine, till we know the contrivance of its Parts. A reaſonable Man muſt in his own mind laugh at theſe poſitive Anatomiſts, who having made a long Harangue about the uſe of Parts, the Structure of which is altogether unknown to them, give this as the only reaſon of all they advance that God and Nature do nothing in vain. They deceive themſelves in the application of this general Maxim; and the Part which they raſhly judge to have been made by God for one end, is afterwards diſcovered to have been made for another. We had therefore much better own our Ignorance, be more reſerved in our Deciſions, and not undertake upon ſuch ſlight conjectures to explain matters which are in their own nature ſo difficult.

ALL that I have hitherto mentioned is but a very ſmall part of what ought to be done, in order to acquire the knowledge of the Brain. We ought moreover to examine the Heads of all Animals, and in all the different ſtates of each Animal. In the Fœtus of Animals, we ſee how the Brain is gradually formed; and what could not be ſeen in a ſound healthy Brain, may perhaps be diſcovered in one that is diſeaſed.

IN living Animals we ought to conſider every thing that may cauſe the leaſt alteration in the Actions of the Brain, whether the Cauſes be external, as from Liquors, Wounds, Medicines, &c. or internal, as a great number of Diſeaſes reckoned up by Phyſicians. There is likewiſe this advantage attending the Diſſection of the Brains of Animals, that we may manage them as we pleaſe. We may learn to trepan or to perform any other Surgical Operation upon them; we may examine whether the Brain has any Motion in theſe Operations, and whether the application of any Medicines to the Dura Mater, or to the Subſtance or Ventricles of the Brain, may not produce ſome particular Effects.

WE might likewiſe make different Trials without opening the Cranium, by applying Medicines exteriourly, by mixing them with the Food, and by Injections into the Veſſels, in order to diſcover what diſturbs the Animal Actions, and what is moſt proper to reſtore them when diſordered.

THE Brain is different in different Animals; and this is another reaſon why we ſhould examine them all. The Brains of Birds and Fiſhes are not at all like that of Man; and even in Animals where there is the greateſt likeneſs to the Human Brain, I have always found a very great Variety. Whatever this difference be, it may always afford us ſome new light, and teach us what it is abſolutely neceſſary we ſhould know. In ſome Animals, the Fibres are more eaſily ſeen than in Men; and the Parts which in the Human Brain are mixed and joined together, are ſometimes diſtinct and ſeparate, in Animals; and we often meet with the Subſtance more or leſs ſolid, and the Size and Situation different.

I need not inſiſt any longer on this Subject, becauſe I believe we are all convinced that we are indebted to the Diſſection of Animals for almoſt all the new Diſcoveries of this Age; and that there are many Parts which would never have been found in the Human Brain, if they had not firſt been obſerved in Animals.

WHAT I have hitherto ſaid concerning the inſufficiency of all the Syſtems of the Brain, concerning the want of a true Method in diſſecting it, concerning the infinite number of Inquiries that ought to be made about it in Man and in Brutes, in all their different ſtates, concerning the barrenneſs of all the Writers on this Subject, and concerning the Precautions that muſt be uſed in handling theſe tender Parts, ought certainly to undeceive thoſe who ſatisfy themſelves with what they find in the Books of the Ancients. We muſt always remain in ignorance if we ſit down with what the Ancients have taught us, and if Men capable of making ſuch Inquiries do not contribute their Labour, Induſtry and Study, in order to arrive at the knowledge of Truth, which is the principal aim of all who ſearch for it ſincerely.

*The Paſſages from* Deſcartes *referred to in this Diſſertation are theſe.*

Page 11. FOR we muſt know that the other Veſſels which bring the Blood from the Heart, having been divided into an infinite number of ſmall Branches diſpoſed in a reticular manner, and which are ſpread like a thin Web in all the Cavities of the Brain, are collected round a certain ſmall Gland ſituated almoſt in the middle of the Subſtance of the Brain at the entry of the Cavities, and have in this place a great number of ſmall Holes, through which the moſt ſubtle Parts of the Blood which they contain, may be conveyed to the Gland, becauſe they are too ſmall to allow the groſſer Parts to paſs. Theſe Arteries do not terminate here, but ſeveral of them being united into one, run up in a ſtreight courſe to that great Veſſel, which like an Euripus ſupplies all the exterior Surface of the Brain.

Page 12. THE Gland is to be looked upon as a rich Source from which the fineſt and moſt agitated Parts of the Blood run on all Hands into the Cavities of the Brain.

Page 63. IMAGINE the Surface which is turned toward the Cavities to be a piece of cloſe Network or Plexus; all the Meſhes of which are ſo many ſmall Holes through which the Animal Spirits may paſs; and being turned toward the Gland from which all theſe Spirits proceed, they can eaſily be directed toward all the different Points of this Gland.

Page 65. THE Spirits do not ſtop any where, but in proportion as they enter the Cavities of the Brain by the Holes of the ſmall Gland; they run directly toward thoſe of the ſmall Tubes which are over againſt them.

Page 72. IN explaining how Figures are marked in the Spirits on the Surface of the Gland, he determines plainly enough the relation which he ſuppoſes to be between the inner Surface of the Brain and that of the Gland.

Page 77. IT ought likewiſe to be conſidered that the Gland is compoſed of a ſoft Matter, and that it is not all united to the Subſtance of the Brain, but only connected to ſmall Arteries (the Coats of which are very looſe and pliable) and ſupported in its Situation by the force of the Blood in theſe Arteries ; ſo that a very ſmall matter may incline it to either ſide, and by ſo doing, diſpoſe the Spirits which it contains, to run toward one part of the Brain rather than to another . . . . . . If the Spirits were of equal force the Gland would always be kept in an immovable erect Poſture in the Center of the Head.

Page 77. As the Spirits flow out more readily from one part of the Brain than from another, they may have force enough to turn the ſmall Tubes in the inner Surface of the Brain into which they run, towards the place from whence they flow out, if they do not find them in that Direction.

## §. 11. *Pericranium.*

196. Besides the external Integuments of the Head, the Skin, Hair, and cellular Subſtance, there is an Aponeurotic Expanſion which covers the Head like a Cap, and is ſpread round the Neck and on the Shoulders like a Riding-Hood ; and for this reaſon I give it in general the name of Hood, and I call the upper Portion of it, the Aponeurotic Cap.

197. This Aponeuroſis is very ſtrong on the Head, and it appears to be made up at leaſt of two Strata of Fibres croſſing each other. As it is ſpread on the Neck it becomes gradually thinner, and ends inſenſibly on the Clavicles. It ſends out a Production on each ſide, from above downward, and from without inward, which having paſſed over the ſuperior Extremity of the Muſculus Sterno-Maſtoidæus, runs behind that Muſcle toward the tranſverſe Apophyſes of the Vertebræ of the Neck, where it communicates with the Ligamenta Intertranſverſalia.

198. The external Surface of all the Bones of the Head, as well as of all the other Bones of the Human Body, except the Teeth, is covered by a particular Membrane, of which that Portion which particularly inveſts the Cranium is named Pericranium, and that which inveſts the Bones of the Face is ſimply termed Perioſteum.

199. The Pericranium is made up of two Laminæ cloſely united together. The internal Lamina which has by ſome been taken for a particular Perioſteum, covers immediately all the bony Parts of this Region ; and the external Lamina has been looked upon as a Membrane diſtinct from the internal, and named Pericranium particularly.

200. The external Lamina of the Pericranium parts from the other, at the ſemi-circular or ſemi-oval Plane mentioned in the Deſcription of the Skeleton N° 182. and becomes a very ſtrong Aponeurotic or Ligamentary Tent which covers the Temporal Muſcle, and is afterwards fixed in the external angular Apophyſis of the Os Frontis, in the poſterior Edge of the ſuperior Apophyſis of the Os Malæ, and in the ſuperior Edge of all the Zygomatic Arch, as far as the Root or Baſis of the Maſtoide Apophyſis.

201. In the Interſtice between the two Laminæ at this place, lies a large Portion of the Muſculus Temporalis, being inſerted in each Lamina in the manner already ſaid in the Deſcription of the Muſcles. The reſt which does not give Inſertion to this Muſcle, that is, between the lower Portion of the Muſcle and Zygomatic Arch, is filled by a cellular and fatty Subſtance. At this place, the Aponeurotic Hood is ſeen to join the external Lamina of the Pericranium, and they both communicate with particular Aponeurotic Expanſions of the neighbouring Muſcles, the Sterno-Maſtoidæus, Maſſeter, Zygomaticus, &c.

## ART. II.

## *The Eye.*

### §. 1. *The Eye in general.*

*Situation and Compoſition.* 202. THE Eyes are commonly two in number, ſituated at the lower part of the Forehead, one at each ſide of the Root of the Noſe; and they are made up of hard and ſoft Parts. The hard Parts are the Bones of the Cranium and Face, which form two Pyramidal or Conical Cavities, like Funnels, to which we give the name of Orbits. The ſoft Parts are of ſeveral kinds.

203. The principal and moſt eſſential ſoft Part in each Organ is the Globe or Ball of the Eye; the others are partly external and partly internal. The external Parts are the Supercilia or Eye-brows, the Palpebræ or Eye-Lids, the Caruncula Lacrymalis, and the Puncta Lacrymalia; and the internal Parts are the Muſcles, Fat, Lacrymal Gland, Nerves and Blood-Veſſels.

*The Orbits.* 204. Seven Bones are concerned in the Compoſition of each Orbit, viz. the Os Frontis, Os Sphenoidale, Os Ethmoides, Os Maxillare, Os Malæ, Os Unguis, and Os Palati. In each Orbit we are to conſider the Edge, Sides and Bottom. The Edge is formed by the Os Frontis, Os Maxillare, and Os Malæ; the Bottom by the Os Sphenoides and Os Palati; and all theſe Bones except the Os Palati, contribute to form the Sides. The Bottom is perforated by the Foramen Opticum of the Os Sphenoides; and the external ſide near this Foramen, by two orbitary Fiſſures, one ſuperior, called Sphenoidalis, the other inferior, called Spheno-Maxillaris, as has been already ſaid in the Deſcription of the Skeleton.

205. All the Cavity of the Orbit is lined by a Membrane, which is an Elongation or Production of the Dura Mater; and it comes partly through the Foramen Opticum of the Os Sphenoides, and partly through the Sphenoidal or ſuperior Orbitary Fiſſure. This Membrane, which may be looked upon as the Perioſteum of the Orbit, communicates with the Perioſteum of the Baſis Cranii, by the inferior Orbitary Fiſſure, and with the Perioſteum

teum of the Face at the Edge of the Orbit. At the upper part of the Edge of the Orbits, the two Perioſtea form a kind of broad Ligament, and a narrow one at the lower part of this Edge, which I ſhall call Ligaments of the Palpebræ.

206. The particular Situation of the Orbits repreſents nearly two Funnels, placed laterally at a ſmall diſtance from each other, in ſuch a manner as that their Apices are almoſt joined, their neareſt ſides almoſt parallel, and the other ſides turned obliquely backward; and for this reaſon, the middle of the great Circumference or Edge of each Orbit, is at a much greater diſtance from the Septum Narium, than the Bottom or Apex; and the Edge or great Circumference is very oblique, the temporal or external Angle of the Orbit lying more backward than the Naſal or internal Angle.

### §. 2. *The Globe or Ball of the Eye.*

*Compoſition.* 207. The Globe of the Eye being the moſt eſſential of all the ſoft Parts belonging to the Organ of Sight; and being likewiſe a Part which we are obliged to mention as often as we ſpeak of the other ſoft Parts, muſt be firſt deſcribed. It is made up of ſeveral proper Parts, ſome of which being more or leſs ſolid, repreſent a kind of Shell formed by the Union of ſeveral Membranous Strata called the Coats of the Globe of the Eye; and the other Parts being more or leſs Fluid, and contained in particular Membranous Capſulæ, or in the Interſtices between the Coats, are termed the Humours of the Globe of the Eye. Theſe Capſulæ are likewiſe termed Coats.

208. The Coats of the Globe of the Eye are of three kinds. Some form chiefly the Shell of the Globe; ſome are additional, being fixed only to a part of the Globe, and ſome are capſular, which contain the Humours. The Coats which form the Shell are three in number. The External, to which the Convexity of the Globe is owing, is termed Tunica Sclerotica or Cornea; the middle Coat is named Choroides, and the third or innermoſt, Retina. The additional Coats are two, one called Tendinoſa or Albuginea, which forms the White of the Eye, and the other, Conjunctiva. The Capſular Tunicæ are likewiſe two, the Vitrea and Cryſtallina.

209. The Globe of the Eye thus formed, ſends out backward a pretty large Pedicle, which is the Continuation of the Optic Nerve. It is ſituated about the middle of the Orbit in the manner which we ſhall afterwards ſee; and it is tied to it by the Optic Nerve, by ſix Muſcles, by the Tunica Conjunctiva, and by the Palpebræ. The backpart of the Globe, the Optic Nerve and Muſcles, are ſurrounded by a ſoft fatty Subſtance, which fills the reſt of the Bottom of the Orbit.

210. The Humors are three in number, the Aqueous, Vitreous and Cryſtalline. The firſt may properly enough be called an Humor, and is contained in a Space formed in the Interſtices of the anterior Portion of

the Coats. The ſecond or Vitreous Humor is contained in a particular Membranous Capſula, and fills above three Fourths of the Shell or Cavity of the Globe of the Eye. It has been named Vitreous from its ſuppoſed reſemblance to melted Glaſs, but it is really more like the White of a new laid Egg.

211. The Cryſtalline Humor is ſo called from its reſemblance to Cryſtal, and is often named ſimply the Cryſtalline. It is rather a Gummy Maſs than an Humor, of a lenticular Form, more convex on the back than on the foreſide, and contained in a fine Membrane called Membrana or Capſula Cryſtallina. What I have here ſaid is ſufficient to give a general Idea of the three Humors of the Globe of the Eye.

### §. 3. *The Coats of the Eye in particular.*

*Tunica Sclerotica.*

212. The moſt external, thickeſt and ſtrongeſt Coat of the Eye is the Sclerotica or Cornea, and it inveſts all the other Parts of which the Globe is compoſed. It is divided into two Portions, one called Cornea Opaca, the other Cornea Lucida, which is only a ſmall Segment of a Sphere, ſituated anteriourly.

213. The Cornea Opaca is made up of ſeveral Strata cloſely connected together, and is of an hard compact Texture reſembling Parchment. About the middle of its poſterior convex Portion where it ſuſtains the Optic Nerve, it is in a manner perforated, and thicker than any where elſe, its thickneſs diminiſhes gradually toward the oppoſite ſide, and its Subſtance is penetrated obliquely in ſeveral places by ſmall Blood-Veſſels. The Courſe of the Nervous Filaments through this Coat is very ſingular; they enter the convex ſide at ſome diſtance from the Optic Nerve, and running from thence through its Subſtance, they pierce the concave ſide near the Cornea Lucida.

214. The Cornea Lucida called likewiſe ſimply Cornea, the opaque Portion being named Sclerotica, is made up in the like manner of ſeveral Strata or Laminæ cloſely united, and appears to be a Continuation of the opaque Portion or Sclerotica, though of a different Texture. When macerated in cold Water, it ſwells.

215. This Portion is ſomething more convex than the Cornea Opaca, ſo that it repreſents the Segment of a ſmall Sphere added to the Segment of a greater; but this difference is not equally great in all Perſons. The Circumference of the convex ſide is not circular as that of the concave ſide, but tranſverſely oval; for the ſuperior and inferior Portions of the Circumference terminate obliquely; but this Obliquity is more apparent in Oxen and Sheep than in Man.

216. The Cornea Lucida is perforated by a great number of imperceptible Pores, through which a very fine Fluid is continually diſcharged, which ſoon afterwards evaporates; but we diſcover it evidently by preſſing the Eye ſoon after Death, having firſt wiped it very clean, for we then ſee a gradual Collection of a very ſubtle Liquor, which forms itſelf into little

Drops; and this Experiment may be ſeveral times repeated on the ſame ſubject. It is this Dew that forms a kind of Pellicle on the Eyes of dying Perſons, which ſometimes cracks ſoon after, as is obſerved in the Memoirs of the Academy for 1721.

*Tunica Choroides.*

217. The ſecond Coat of the Globe of the Eye is the Choroides which is of a blackiſh Colour, more or leſs inclined to red, and adheres by means of a great number of ſmall Veſſels, to the Cornea Opaca from the Inſertion of the Optic Nerve all the way to the Union of the two Corneæ, where it leaves the Circumference of the Globe and forms a perforated Septum, by which the ſmall Segment of the Globe is ſeparated from the greater. This Portion goes commonly by the particular Name of Uvea, which was formerly given to the whole ſecond Coat; and as it is of different Colours in ſeveral Subjects, it has likewiſe got the name of Iris, which term, however, agrees more preciſely to the coloured Surface of this Portion, and would even be very improper for this Surface in Perſons where it is uniformly brown, black, or blackiſh.

218. The external Lamina of the Choroides is ſtronger than the internal, and both appear blackiſh becauſe of their Tranſparency. At a very ſmall diſtance from the Union of the two Corneæ, this Lamina is moſt cloſely united to the Cornea Opaca. Round this Adheſion it changes Colour and forms a whitiſh Ring of the ſame breadth with the Adheſion; and near the Edge of the Sclerotica this Ring is ſtronger and of a different Texture from what it is any where elſe. It adheres ſo cloſely to the Sclerotica, that if we blow through a ſmall Hole made therein without touching the Choroides, the Air will penetrate every where between the two Coats, but cannot deſtroy this Adheſion, or paſs to the Cornea Lucida. This Adheſion has been improperly named Ligamentum Ciliare. On the inner Surface of this Lamina we diſcover a great number of flat Lines in a vortical Diſpoſition, which are the Veſſels named by *Steno* Vaſa Vorticoſa, or Vortices Vaſculoſi, of which hereafter.

219. The internal Lamina of the Choroides is thinner than the external; and its Surface, together with the correſponding Surface of the other Lamina, is covered by a blackiſh Subſtance with ſome mixture of red, which eaſily ſeparates when touched, and immediately tinges the Water in which the Choroides is dipt. The Origin of this Subſtance has not as yet been diſcovered; but after a nice Anatomical Injection, I have obſerved a great number of vaſcular Stars on the inner Surface of this Lamina. In *M. Ruyſche*'s Works, it is termed Membrana Ruyſchiana.

*Uvea, Iris, Pupilla, and Proceſſus Ciliares.*

220. The anterior Portion or perforated Septum of the Choroides has the name of Uvea, and the Hole near the Center of this Septum is called Pupilla. The anterior Lamina of the ſame Septum is termed Iris, and the radiated Plicæ of the poſterior Lamina, Proceſſus Ciliares. Between the two Laminæ of the Uvea we find two very thin Planes of Fibres which appear to be fleſhy, the Fibres of one Plane being Orbicular, and lying round the Circumference of the Pupilla, and thoſe of the other being

ing radiated, one Extremity of which is fixed to the orbicular Plane, the other to the great Edge of the Uvea.

221. The Plicæ or Proceſſus Ciliares are ſmall radiated and prominent Duplicatures of the poſterior Lamina of the Uvea, and their Circumference anſwers partly to that of the white Ring of the external Lamina. They are oblong thin Plates; their poſterior Extremities, or thoſe next the Choroides being very fine and pointed; the others, or thoſe next the Pupilla, broad, prominent, and ending in acute Angles. In the Duplicature of each Ciliary Fold we find a fine reticular Texture of Veſſels; and ſome pretend to have ſeen fleſhy Fibres in the ſame place, lying in ſmall Grooves of the Membrana Vitrea, as we ſhall ſee hereafter.

222. The Space between the Cornea Lucida and Uvea, contains the greateſt part of the Aqueous Humor, and communicates by the Pupilla with a very narrow Space behind the Uvea, or between that and the Cryſtalline. Theſe two Spaces have been termed the two Chambers of the Aqueous Humor, one anterior, the other poſterior, as I ſhall obſerve in deſcribing this Humor in particular.

*Retina.* 223. The third Coat of the Eye is of a very different Texture from that of the other two Coats. It is white, ſoft and tender, and, in a manner, medullary, or like a kind of Paſte ſpread upon a fine reticular Web. It appears to be thicker than the Choroides, and reaches from the Inſertion of the Optic Nerve, to the Extremities of the Ciliary Radii, being equally fixed to the Choroides through its whole Extent. At the Place which anſwers to the Inſertion of the Optic Nerve, we obſerve a ſmall Depreſſion, in which lies a ſort of medullary Button terminating in a Point; and from this Depreſſion Blood-Veſſels go out, which are ramified on all ſides through the Subſtance of the Retina.

224 It is commonly ſaid that the Retina is a Production or Expanſion of the medullary Subſtance of the Optic Nerve; the Sclerotica, of the Dura Mater, and the Choroides, of the Pia Mater, which accompanies this Nerve. But this Opinion is not agreeable to what we obſerve in examining the Optic Nerve, and its Inſertion in the Globe of the Eye. If we take a very ſharp Inſtrument and divide this Nerve through its whole length, between where it enters the Orbit and where it enters the Globe, into two equal lateral Parts, and then continue this Section through the Middle or Center of its Inſertion, the following Phænomena will appear.

225. That the Nerve contracts a little at its Inſertion into the Globe; that its outer Covering is a true Continuation of the Dura Mater; that this Vagina is very different from the Sclerotica both in Thickneſs and Texture, the Sclerotica being thicker than the Vagina, and of another Structure; that the Vagina from the Pia Mater forms through the whole medullary Subſtance of the Nerve, ſeveral very fine cellular Septa, and that where it enters the Globe of the Eye, the Pia Mater dees not directly anſwer to the Choroides.

226. Laſtly, That as the medullary Subſtance of the Nerve enters the Globe it is very much contracted, and ſeems to terminate only in the ſmall Tubercle or Button already mentioned, and that the Retina is too thick to be taken for an Expanſion of the medullary Subſtance at this place.

227. The Inſertion of the Optic Nerve in the Globe of the Eye is moſt commonly, not directly oppoſite to the Pupilla, ſo that the diſtance between theſe two Parts is not the ſame when meaſured on all Parts of the Globe. The greateſt diſtance is ofteneſt on the ſide next the Temples, and the ſmalleſt, next the noſe. I have obſerved an inequality of the ſame kind in the breadth of the Uvea, which in many Subjects is leſs near the Noſe than near the Temples; ſo that the Center of the Pupilla is not the ſame with that of the great Circumference of the Iris; and I have ſeen the ſame difference in the breadth of the Corona Ciliaris.

## §. 4. *The Humours of the Eye and their Capſulæ.*

*The Vitreous Humour.*

228. The Vitreous Humour is a clear and very Liquid Gelatinous Fluid contained in a fine tranſparent Capſula, called Tunica Vitrea, together with which it forms a Maſs nearly of the Conſiſtence of the White of an Egg. It fills the greateſt part of the Globe of the Eye, that is, almoſt all that Space which anſwers to the extent of the Retina, except a ſmall Portion behind the Uvea, where it forms a Foſſula, in which the Cryſtalline is lodged. This Humour being dexterouſly taken out of the Globe, preſerves its Conſiſtence for ſome time in the Capſula, almoſt like the White of an Egg, and then runs off by little and little, till it quite diſappears.

229. The Tunica Vitrea is compoſed exteriourly of two Laminæ very cloſely connected, which quite ſurround the Maſs of Humour, and are immediately applied to the Retina all the way to the great Circumference of the Corona Ciliaris; but from thence to the circular Edge of the Foſſula of the Cryſtalline, this Coat is full of radiated Sulci which contain the Proceſſus Ciliares of the Uvea. At the Edge of the Foſſula, the two Laminæ ſeparate and form a particular Capſula which belongs to the Cryſtalline, as we ſhall ſee hereafter.

230. The internal Lamina of the Tunica Vitrea gives off through the whole Subſtance of this Humour, a great number of cellular Elongations, or Septa ſo extremely fine, as not at all to be viſible in the natural ſtate, the whole Maſs appearing then to be uniform and equally tranſparent through its whole Subſtance; but they are diſcovered by putting the whole ſoon after it is taken out of the Body into ſome aceſcent, and gently coagulating Liquor.

231. The radiated Sulci of the Tunica Vitrea which may be termed Sulci Ciliares, are perfectly black, when the Coat is taken out of the Body. This proceeds from the black Subſtance with which the Laminæ or Proceſſus Ciliares are naturally covered, as well as all the reſt of the Choroides, and which remains in the bottom of the Sulci, after the Laminæ have been

taken out. We obſerve very fine Veſſels in this Humour, which ſhall be ſpoken to hereafter.

*The Cryſtalline Humour.* 232. The Cryſtalline is a ſmall Lenticular Body of a pretty firm Conſiſtence, and tranſparent like Cryſtal. It is contained in a tranſparent Membranous Capſula, and lodged in the anterior Foſſula of the Vitreous Humour, as has been already ſaid. It is very improperly called an Humour, becauſe it may be handled and moulded into different Shapes by the Fingers, and ſometimes almoſt diſſolved by different reiterated Compreſſions, eſpecially when taken out of the Capſula.

233. The Figure of the Cryſtalline is lenticular, but its poſterior ſide is more convex than the anterior, the Convexity of both ſides being very rarely equal. The internal Structure of this Maſs has not been hitherto ſufficiently diſcovered, to be deſcribed with certainty, eſpecially in Man, where I could never find that contorted Diſpoſition of Cryſtalline Tubes which ſome pretend to have ſeen in the Eyes of large Animals.

234. The Colour and Conſiſtence of the Cryſtalline varies in different Ages, as was diſcovered by *M. Petit* the Phyſician, and demonſtrated by him in the Academy of Sciences from a great number of Human Eyes; and his Obſervations are inſerted in the Memoirs for 1726. Till the Age of thirty, it is very tranſparent, and almoſt without any Colour. It afterwards becomes yellowiſh, and that yellowneſs gradually increaſes. The Conſiſtence varies almoſt in the ſame manner, being of an uniform ſoftneſs till the Age of twenty, and afterwards growing gradually more ſolid in the middle of the Maſs; but in this there are Varieties explained in the Memoirs for 1727.

235. The Cryſtalline Capſula or Coat is formed by a Duplicature of the Tunica Vitrea, as I have already ſaid. The external Lamina covers the anterior ſide of the Cryſtalline Maſs; the internal Lamina covers the backſide, and likewiſe the Foſſula Vitrea in which the Cryſtalline is lodged. The anterior Portion of the Cryſtalline Capſula is thicker than the poſterior, and in a manner, elaſtic; and both its Thickneſs and Elaſticity may be diſcovered in Diſſection, without any other Artifice.

236. The anterior Portion ſwells when macerated in Water, and then appears to be made up of two Pelliculæ, united by a fine ſpungy Subſtance. I demonſtrated this Duplicature very plainly in the Eye of an Horſe by the Knife alone, and I even carried the Separation of the two Laminæ as far as the Vitreous Coat. Having made a ſmall Hole in the middle of the Capſula, and blown into it through a Pipe, ſome part of the Air remained between the Edge of the Cryſtalline Maſs and that of the Capſula in form of a tranſparent Circle. This Experiment was made with an Ox's Eye above ten Years ago.

237. In examining the Human Eye, I have found that the Retina having reached the great Circumference of the Corona Ciliaris becomes very thin, and is continued between the Laminæ or Proceſſus Ciliares of the Uvea, and the Ciliary Sulci of the Tunica Vitrea, all the way to the Circumference of the Cryſtalline. It is perhaps this Continuation which

makes the Proceſſus Ciliaris to be covered by a whitiſh Pellicle, and likewiſe increaſes the Thickneſs of the anterior Portion of the Capſula Cryſtallina.

238. The Aqueous Humour is a very Limpid Fluid reſembling a kind of Lympha or Serum with a very ſmall degree of Viſcidity; and it has no particular Capſula like the Cryſtalline and Vitreous Humours. it fills the Space between the Cornea Lucida and Uvea, that between the Uvea and the Cryſtalline, and the Hole of the Pupilla. Theſe two Spaces are called the Chambers of the Aqueous Humour, and they are diſtinguiſhed into the Anterior and Poſterior.

239. These two Chambers are not of the ſame extent. The Anterior, which is viſible to every body between the Cornea Lucida and Uvea, is the largeſt; the other between the Uvea and Cryſtalline is very narrow, eſpecially near the Pupilla, where the Uvea almoſt touches the Cryſtalline. This Proportion between the two Chambers has been ſufficiently proved, contrary to the Opinion of many antient Writers, by *M. Heiſter*, *Morgagni*, and ſeveral Members of the Royal Academy; but none has treated theſe Matters at ſo great a length as *M. Petit* the Phyſician, as appears by the printed Memoirs of that Society.

### §. 5. *The Tunica Albuginea and Muſcles of the Globe of the Eye.*

240. The Tunica Albuginea, called commonly the White of the Eye, and which appears on all the anterior convex ſide of the Globe, from the Cornea Lucida to the beginning of the poſterior ſide, is formed chiefly by the Tendinous Expanſion of four Muſcles, in the manner preſently to be deſcribed. This Expanſion adheres very cloſe to the Sclerotica and makes it appear very white and ſhining, whereas the reſt of it is of a dull whitiſh Colour. It is very thin near the Edge of the Cornea, in which it ſeems to be loſt, terminating very uniformly.

241. There are commonly ſix Muſcles inſerted in the Globe of the Human Eye, and they are divided, on account of their Direction, into four Recti and two Obliqui. The Recti are again divided from their Situation, into Superior, Inferior, Internal and External; and from their Functions, into a Levator, Depreſſor, Adductor and Abductor. The two oblique Muſcles are denominated from their Situation and Size, one being named Obliquus Superior, or Major; the other Obliquus Inferior, or Minor. The Obliquus Major is likewiſe called Trochlearis, becauſe it paſſes through a ſmall Cartilaginous Ring, as over a Trochlea or Pulley.

242. The Muſculi Recti do not altogether anſwer to that name, for in their natural Situation they do not all lie in a ſtreight Direction, as they are commonly repreſented in an Eye taken out of the Body. To underſtand this, we ought to have a juſt Idea of the Situation of the Globe in the Orbit, and at the ſame time to remember the Obliquity of the Orbits, as already explained. The Globe is naturally placed in ſuch a manner, as that during the Inaction or Equilibrium of all the Muſcles, the Pupilla is turned

directly

directly forward; the inner Edge of the Orbit is oppoſite to the middle of the inſide of the Globe; the outer Edge of the Orbit, becauſe of its Obliquity, is behind the middle of the outſide of the Globe; and laſtly, the greateſt Circumference of the Convexity of the Globe between the Pupilla and the Optic Nerve, runs directly inwards and outwards, upwards and downwards.

243. In this Situation, the internal Rectus alone is in a ſtreight Direction, the other three being oblique; and the external Rectus is the longeſt, the internal, the ſhorteſt, and the ſuperior and inferior, of the ſame middle length between the two former. The external Rectus is likewiſe bent round the outer convex ſide of the Globe; the ſuperior and inferior are alſo incurvated, but in a leſs degree, whereas the whole internus is almoſt ſtreight: Notwithſtanding all this I ſhall ſtill continue to give them all, the common name of Muſculi Oculi Recti.

244. These Muſcles are fixed by their poſterior Extremities at the bottom of the Orbit near the Foramen Opticum, in the Elongation of the Dura Mater, by ſhort narrow Tendons, in the ſame order in which I have already named them. From thence they run wholly fleſhy, toward the great Circumference of the Convexity of the Globe between the Optic Nerve and Cornea Lucida, where they are expanded into flat broad Tendons which touch each other, and afterwards unite. Theſe Tendons are fixed firſt of all by a particular Inſertion, in the Circumference juſt mentioned, and afterwards continue their Adheſion all the way to the Cornea, forming the Tunica Albuginea, as has been already ſaid.

245. The ſuperior oblique Muſcle is fixed to the bottom of the Orbit, by a narrow Tendon, in the ſame manner as the Recti, between the Rectus Superior and Internus. From thence it runs on the Orbit oppoſite to the Interſtice between theſe two Muſcles, toward the internal angular Apophyſis of the Os Frontis, where it terminates in a thin Tendon, which having paſſed through a kind of Ring as over a Pulley, runs afterwards in a Vagina obliquely backward under the Rectus Superior, that is, between that Muſcle and the Globe; and increaſing in breadth it is inſerted poſteriourly and laterally in the Globe, near the Rectus Externus.

246. The Ring through which this Muſcle paſſes, is partly Cartilaginous and partly Ligamentary. The Cartilaginous Portion is flat, of a conſiderable breadth, and like half a Ring. The Ligamentary Portion adheres ſtrongly to the two Ends of the Cartilage, and is fixed in the ſmall Foſſula which lies in the Orbit, on the angular Apophyſis of the Os Frontis. By means of this Ligament, the Ring is in ſome meaſure moveable, and yields to the Motions of the Muſcle. To the anterior Edge of the Ring, a Ligamentary Vagina is fixed which inveſts the Tendon all the way to its Inſertion in the Globe.

247. The Obliquus Inferior is ſituated obliquely at the lower ſide of the Orbit, under the Rectus Inferior, which conſequently lies between this Muſcle and the Globe. It is fixed by one Extremity a little Tendinous, to the Root of the Naſal Apophyſis of the Os Maxillare, near the Edge of

the Orbit between the Opening of the Ductus Naſalis, and the Inferior Orbitrary Fiſſure.

248. From thence it paſſes obliquely, and a little tranſverſely backward, under the Rectus Inferior, and is fixed in the poſterior lateral part of the Globe by a flat Tendon, oppoſite to, and at a ſmall diſtance from the Tendon of the Obliquus Superior, ſo that theſe two Muſcles do in ſome meaſure ſurround the outer poſterior part of the Globe.

*Uſes of theſe Muſcles.*

249. The Rectus Superior moves the anterior Portion of the Globe upward when we lift up the Eyes; the Rectus Inferior carries this Portion downward; the Internus, toward the Noſe; and the Externus, toward the Temples.

250. When two neighbouring Recti act at the ſame time, they carry the anterior Portion of the Globe obliquely toward that ſide which anſwers to the diſtance between theſe two Muſcles; and when all the four Muſcles act ſucceſſively, they turn the Globe of the Eye round, which is what is called Rolling the Eyes.

251. It is to be obſerved, that all theſe Motions of the Globe of the Eye are made round its Center, ſo that in moving the anterior Portion all the other Parts are likewiſe in Motion. Thus when the Pupilla is turned toward the Noſe or upward; the Inſertion of the Optic Nerve is at the ſame time turned toward the Temple, or downward.

252. The uſe of the oblique Muſcles is chiefly to counterbalance the Action of the Recti, and to ſupport the Globe in all the Motions already mentioned. This is evident from their Inſertions which are in a contrary Direction to thoſe of the Recti, their fixed Points with relation to the Motions of the Globe being placed forward, and thoſe of the Recti, backward, at the bottom of the Orbit. The ſoft Fat which lies behind the Globe is altogether inſufficient to ſupport it; neither is the Optic Nerve more fit for this purpoſe; for I have ſhewn that this Nerve follows all the Motions of the Globe which would be impoſſible, were not the Fat very pliable, and without reſiſtance. And to this we muſt add, that the Optic Nerve at its Inſertion in the Globe has a particular Curvature, which allows it to be elongated, and conſequently prevents it from ſuffering any Violence in the different Motions of the Eyes.

253. The Obliquity of theſe two Muſcles does not hinder them from doing the Office of a Fulcrum, becauſe this is not a Fulcrum diſtinct from the Part moved, or on which the Globe of the Eye ſlides like the Head of one Bone in the articular Cavity of another, but being fixed to the Part, it eaſily accommodates itſelf to all the degrees of Motion thereof. Had theſe Muſcles lain in a ſtreight Direction they would have incommoded the Recti, but their Obliquity may be ſaid to be in ſome meaſure rectified by the inner Surface of the Orbit, and by the Rectus Externus.

254. The inner Surface of the Orbit ſerves for a kind of collateral Fulcrum, which hinders the Globe from falling too far inward; as the joint Action of the two Obliqui prevents it in part from falling too far outward. The Rectus Externus by being bent on the Globe not only hinders

it from being carried outward, but alſo prevents the indirect Motions of the Obliqui from thruſting it out of the Orbit toward the Temples. The other uſes attributed to theſe Muſcles ſeem to me to be without Foundation, from the Conſideration of their Inſertions, and of the Structure of the Parts with which they are concerned; both which Reaſons are explained in the Memoirs of the Academy for 1721.

### §. 6. *The Supercilia, and Muſculi Frontales, Occipitales and Superciliares.*

*Supercilia.* 255. The Supercilia or Eye-Brows are the two hairy Arches ſituated at the lower part of the Forehead, between the top of the Noſe and Temples in the ſame Direction with the bony Arches which form the ſuperior Edges of the Orbits. The Skin in which they are fixed does not ſeem to be much thicker than that of the reſt of the Forehead; but the Membrana Adipoſa is thicker than on the neighbouring Parts. The Extremity of the Eye-Brows next the Noſe is called the Head, as being larger than the other Extremity, which is named their Tail. Their Colour is different in different Perſons, and often in the ſame Perſon, different from that of the Hair on the Head; neither is the Size of them always alike. The Hairs of which they conſiſt are ſtrong and pretty ſtiff, and they lie obliquely, their Roots being turned to the Noſe, and their Points to the Temples.

256. The Supercilia have Motions common to them with thoſe of the Skin of the Forehead, and of the hairy Scalp. By theſe Motions the Eye-Brows are lifted up, the Skin of the Forehead is wrinkled more or leſs regularly and tranſverſely; and the Hair and almoſt the whole Scalp is moved, but not in the ſame degree in all Perſons; for ſome by this Motion alone can move their Hat, and even throw it off from their Head. The Eye-Brows have likewiſe particular Motions which contract the Skin above the Noſe; and all theſe different Motions are performed by the following Muſcles.

*Muſculi Frontales.* 257. The Frontal Muſcles are two thin, broad, fleſhy Planes of unequal lengths, lying immediately behind the Skin and Membrana Adipoſa on the anterior Parts of the Forehead, which Parts they cover from the Root of the Noſe, and through about two thirds of the Arch of the Eye-Brows on each ſide, all the way to the lateral Parts of the Hair on the Forehead. At the Root of the Noſe they touch each other as if they were but one Muſcle, and at this place their Fibres are ſhort and longitudinal, or vertical.

258. The next Fibres on each ſide become gradually longer and more oblique, the moſt anterior being always the ſhorteſt and ſtreighteſt; and the lateral, the longeſt and turned moſt obliquely toward the Temples at their upper Extremities. By this Diſpoſition an angular Interſtice is formed between the place where the two Muſcles join, and the Hair on the middle of the Forehead; but this Diſpoſition is not the ſame in all Subjects, no more than the Wrinkles, and Bounds of the Hair on the Forehead.

259. These Muſcles are fixed by the inferior Extremities of their fleſhy Fibres immediately in the Skin, running through the Membrana Adipoſa. They cover the Muſculi Superciliares, and adhere cloſely to them by a kind of Intertexture. By the ſame Fibres they ſeem to be inſerted in the angular Apophyſes of the Os Frontis, and to be blended a little with the Muſcles of the Palpebræ and Noſe. The upper Extremities of their fleſhy Fibres are fixed in the external or convex Surface of the Pericranium. Each of their lateral Portions covers a Portion of the Temporal Muſcle on the ſame ſide, and adheres very cloſely to it. The ſuperior and inferior Inſertions are graduated.

260. The Occipital Muſcles are too ſmall, thin, broad, and very ſhort fleſhy Planes, ſituated on the lateral Parts of the Occiput at ſome diſtance from each other. They are inſerted by the inferior Extremities of their fleſhy Fibres in the ſuperior tranſverſe Line of the Os Occipitis, and alſo a little above it. From thence they run up obliquely from behind forward, and are fixed in the inner or concave Surface of the Pericranium. *Muſculi Occipitales.*

261. The breadth of theſe Muſcles reaches from the poſterior middle part of the Occiput, toward the Maſtoide Apophyſis, and they diminiſh unequally in length as they approach theſe Apophyſes. From this inequality in length each of them appears as if it were double in ſome Subjects; and in others they are ſo thin and pale, that they ſeem to be wanting. They are ſometimes covered by an Aponeurotic Expanſion of the Trapezii.

262. The Occipital and Frontal Muſcles appear to be true Digaſtrici, both in regard to their Inſertions in the Pericranium, and in regard to their Action. Their Inſertions in the Pericranium are oppoſite, one being on the outſide, the other on the inſide; ſo that this Membrane or Aponeuroſis may be conſidered as a middle Tendon of four ſingle Muſcles, that is, which have their fleſhy Fibres fixed only to one ſide of their Tendons. The fixed Inſertions of the Occipitales at the lower part of the Occiput, and the moveable Inſertions of the Frontales in the Skin of the Forehead and of the Supercilia, being well conſidered, together with their reciprocal Inſertions in the ſame Aponeuroſis, ſeem to be a very convincing proof that they are Digaſtric Muſcles.

263. These four Muſcles ſeem always to act in concert, the Occipitales bring only Auxiliaries or Aſſiſtants to the Frontales, the Office of which is to raiſe the Supercilia, by wrinkling the Skin of the Forehead; theſe Wrinkles following the Direction of the Eye-Brows pretty regularly in ſome Subjects, and very irregularly in others.

264. To be convinced of the Co-operation of theſe four Muſcles, we need only hold the Hand on the Occipitales, while we raiſe the Eye-brows and wrinkle the Forehead ſeveral times; and we will perceive the Occipitales to move each time, though not in the ſame degree in all Subjects. In ſome Perſons the Occipitales ſeem to be relaxed, while the Frontales being in Contraction, move the whole Scalp and Pericranium forward, and then contract to bring them back to their natural Situation.

*Muſculi Superciliares.*

265. The Muſculi Superciliares are fleſhy Faſciculi ſituated behind the Supercilia, and behind the inferior Portion of the Muſculi Frontales, from the Root of the Noſe to above one half of each Superciliary Arch. They are ſtrongly inſerted partly in the Synarthroſis of the Oſſa Naſi with the Os Frontis, where they come very near the proper Muſcles of the Noſe, and partly in a ſmall neighbouring Portion of the Orbit. From thence they firſt run up a little, and afterwards more or leſs in the Direction of the Eye-Brows. They are made up of ſeveral ſmall Faſciculi of oblique Fibres, all fixed by one end in the manner already ſaid, and by the other partly in the lower Extremity of the Muſcles by which they are covered, and partly in the Skin of the Supercilia. This laſt Portion is eaſily confounded with a Portion of the Muſculus Orbicularis Palpebrarum.

266. The Action of theſe Muſcles is to depreſs the Eye-Brows, to bring them cloſe together, and to contract the Skin of the Forehead immediately above the Noſe, into longitudinal and oblique Wrinkles, and the Skin which covers the Root of the Noſe into irregular tranſverſe Wrinkles. This Action, as well as that of the Frontales, and of the Muſcles of the Noſe and Lips, is not always arbitrary, but ſometimes mechanical and involuntary. Theſe Muſcles may perhaps likewiſe ſerve to keep the Muſculi Frontales in Equilibrio during their inaction, they being moveable by both Extremities.

## §. 7. *The Palpebræ and Membrana Conjunctiva.*

*Palpebræ.*

267. The Palpebræ are a kind of Veils or Curtains placed tranſverſely above and below the anterior Portion of the Globe of the Eye; and accordingly there are two Eye-lids to each Eye, one ſuperior, the other inferior. The Superior is the largeſt and moſt moveable in Man; the Inferior the ſmalleſt and leaſt moveable. They both unite at each ſide of the Globe, and the places of their Union are termed Angles, one large and internal which is next the Noſe, the other ſmall or external which is next the Temples.

*Structure of the Palpebræ.*

268. The Palpebræ are made up of common and proper Parts. The common Parts are the Skin, Epidermis, and Membrana Adipoſa. The proper Parts are the Muſcles, the Tarſi, the Puncta or Foramina Lacrymalia, the Membrana Conjunctiva, the Glandula Lacrymalis, and the particular Ligaments which ſuſtain the Tarſi. The Tarſi and their Ligaments are in ſome meaſure the Baſis of all theſe Parts.

*Tarſi.*

269. The Tarſi are thin Cartilages forming the principal Part of the Edge of each Palpebra; and they are broader at the Middle than at the Extremities. Thoſe of the ſuperior Palpebræ are ſomething leſs than half an Inch in breadth; but in the lower Palpebræ they are not above the ſixth part of an Inch; and their Extremities next the Temples are more ſlender than thoſe next the Noſe.

270. These Cartilages are ſuited to the Borders and Curvature of the Eye-Lids. The lower Edge of the ſuperior Cartilage and the upper Edge

of the inferior, terminate equally, and both may be termed the Cilary Edges. The oppoſite Edge of the upper Tarſus is ſomething ſemi-circular between its two Extremities; but that of the inferior Tarſus is more uniform, and both are thinner than the Ciliary Edges. Their inner ſides or thoſe next the Globe are grooved by ſeveral ſmall tranſverſe Channels, of which hereafter; and the Extremities of both Cartilages are connected by a kind of ſmall Ligaments.

*Ligamenta Tarſorum Lata.*

271. The broad Ligaments of the Tarſi are membranous Elongations formed by the Union of the Perioſteum of the Orbits and Pericranium along both Edges of each Orbit. The ſuperior Ligament is broader than the inferior, and fixed to the ſuperior Edge of the upper Cartilage, as the inferior is to the lower Edge of the lower Cartilage, ſo that theſe Ligaments and the Tarſi taken alone or without the other Parts, repreſent Palpebræ. This diſcovery I firſt communicated in my private Courſes.

*Membrana Conjunctiva.*

272. The Membrana Conjunctiva is generally deſcribed among the Coats of the Globe of the Eye; and I alſo mentioned it there, but have referred the Deſcription of it to that of the Palpebræ. It is a thin Membrane, one Portion of which lines the inner Surface of the Palpebræ, that is, of the Tarſi and their broad Ligaments. At the Edge of the Orbit it has a Fold, and is continued from hence on the anterior half of the Globe of the Eye, adhering to the Tunica Albuginea; ſo that the Palpebræ and the Forepart of the Globe of the Eye are covered by one and the ſame Membrane, which does not appear to be a Continuation of the Pericranium, but has ſome Connexion with the broad Ligaments of the Tarſi.

273. The name of Conjunctiva is commonly given only to that part which covers the Globe, the other being called ſimply the internal Membrane of the Palpebræ; but we may very well name the one Membrana Oculi Conjunctiva, and the other Membrana Palpebrarum Conjunctiva. That of the Palpebræ is a very fine Membrane adhering very cloſe and full of ſmall capillary Blood-Veſſels. It is perforated by numerous imperceptible Pores through which a kind of Serum is continually diſcharged; and it has ſeveral very evident Folds which ſhall be ſpoken to hereafter.

274. The Conjunctiva of the Eye adheres by the Intervention of a cellular Subſtance, and is conſequently looſe, and as it were, moveable; and it may be taken hold of and ſeparated in ſeveral places from the Tendinous Coat. It is of a whitiſh Colour, and being tranſparent, the Albuginea makes it appear perfectly white; theſe two Coats together forming what is called the White of the Eye. The greateſt part of the numerous Veſſels which run upon it contain naturally only the ſerous part of the Blood, and conſequently are not diſcoverable, except by Anatomical Injections, Inflammations, Obſtructions, &c. With the Point of a good Knife we continue the Separation of this Membrane over the Cornea Lucida.

*Glandula Lacrymalis.*

275. The Lacrymal Gland is white, and of the number of thoſe called Conglomerate Glands. It lies under that Depreſſion obſervable in the Arch

of the Orbit near the Temples, mentioned in the Deſcription of the Skeleton N° 199. and laterally above the Globe of the Eye. It is a little flatted, and divided as it were into two Lobes, one of which lies toward the Inſertion of the Muſculus Rectus Superior; the other toward the Rectus Externus. It adheres very cloſely to the Fat which ſurrounds the Muſcles, and poſterior Convexity of the Eye, and it was formerly named Glandula Innominata.

276. From this Gland ſeveral ſmall Ducts go out, which run down almoſt parallel to each other, through the Subſtance of the Tunica Interna or Conjunctiva of the ſuperior Palpebra, and afterwards pierce it inwardly near the ſuperior Edge of the Tarſus. Theſe Ducts are very difficult to be found; but the beſt way to diſcover them is to let the ſuperior Palpebra lie for a little while in cold Water, and then without wiping it, to blow on ſeveral places of the Surface of the Membrane, through a ſmall Tube held very near, but ſo as not to touch it, that the Air may fill ſome of the Orifices of the Ducts and ſo diſcover them.

277. THE Borders of each Palpebra taken all together are formed by the Edge of the Tarſus, and by the Union of the internal Membrane, with the Skin and Epidermis. This Border is flat and of ſome ſenſible breadth from within about a Quarter of an Inch of the internal Angle all the way to the external Angle, near which the Breadth diminiſhes. This Breadth is owing only to the thickneſs of the Palpebræ, which at this place have their Edges oblique or ſlanting, in ſuch a manner as when the two Palpebræ touch each other ſlightly, a triangular Space or Canal is formed between them and the Globe of the Eye.

*Cilia:*

278. THE flat Edge of each Palpebra is adorned with a Row of Hairs called Cilia, or the Eye-Laſhes. Thoſe belonging to the ſuperior Palpebra are bent upward, and longer than thoſe of the lower Palpebra which are bent downward. Theſe Rows are placed next the Skin, and are not ſingle, but irregularly double or triple. The Hairs are longer near the middle of the Palpebræ than toward the Extremities, and for about a Quarter of an Inch from the inner Angle, they are quite wanting.

*Glandulæ Ciliares.*

279. ALONG the ſame Border of the Palpebræ near the internal Membrane, or toward the Eye, we ſee a row of ſmall Holes which may be named Foramina, or Puncta Ciliaria. They are the Orifices of the ſame number of ſmall oblong Glands which lie in the Sulci, Channels, or Grooves on the inner Surface of the Tarſus. Theſe little Glands are of whitiſh Colour, and when examined through a ſingle Microſcope, they appear like Bunches of Grapes, thoſe of each Bunch communicating together. And when they are ſqueezed between two Nails, a ſebaceous Matter like ſoft Wax, is diſcharged through the Puncta Ciliaria.

*Puncta Lacrymalia.*

280. NEAR the great or internal Angle of the Palpebræ, the flat Portion of their Edges terminates in another which is rounder and thinner. By the Union of theſe two Edges an Angle is formed, which is not perfectly pointed like a true Angle, but rounded, and yet it ought not to be termed an obtuſe Angle, becauſe that expreſſion in the Mathematical Stile means

ſomething different. For the ſame reaſon the name of great Angle is improper; and we had better call it the Internal or Naſal Angle.

281. At this place, the Extremity of the flat Portion is diſtinguiſhed from the round Portion by a ſmall Protuberance or Papilla, which is obliquely perforated by a ſmall Hole in the Edge of each Palpebra. Theſe two ſmall Holes are very viſible, and often more ſo in living than in dead Bodies, and they are commonly named Puncta Lacrymalia, being the Orifices of two ſmall Ducts which open beyond the Angle of the Eye into a particular Reſervoir, termed Sacculus Lacrymalis, which ſhall be deſcribed in the Article of the Noſe.

282. The Puncta Lacrymalia are oppoſite to each other, and ſo they meet when the Eye is ſhut. Round the Orifice of each of theſe Points, we obſerve a whitiſh Circle which ſeems to be a Cartilaginous Appendix of the Tarſus, and which keeps the Orifice always open. Theſe two oblique Circles are ſo diſpoſed, that when the Eye is but ſlightly ſhut they touch each other only toward the Skin, and not toward the Globe of the Eye. The fine Membrane which covers theſe Circles, and paſſes through the Puncta into the Ducts, ſeems ſometimes to run into Gathers when it is touched with a Stilet. This Obſervation was firſt made by the late *M. Saint Yves* a *Pariſian* Oculiſt.

*Caruncula Lacrymalis.*

283. The Caruncula Lacrymalis is a ſmall reddiſh, granulated, oblong Body, ſituated preciſely between the internal Angle of the Palpebræ and Globe of the Eye, but it is not fleſhy as its name would inſinuate. The Subſtance of it ſeems to be wholly glandular; and it appears through a ſingle Microſcope, in the ſame manner as the other Conglomerate Glands. We diſcover upon it a great number of fine Hairs covered by an oily yellowiſh Matter; and on the Globe of the Eye, near this glandular Body, we ſee a ſemilunar Fold formed by the Conjunctiva, the concave ſide of which is turned to the Uvea, and the convex ſide to the Noſe. This Fold appears moſt when the Eye is turned toward the Noſe.

## §. 8. *The Muſcles of the Palpebræ.*

284. The Muſcles of the Palpebræ are commonly reckoned to be two, one peculiar to the upper Eye-Lid, named Levator Palpebræ Superioris; the other common to both, called Muſculus Orbicularis Palpebrarum, which has been ſubdivided in different manners, as we ſhall ſee preſently.

*Levator Proprius.*

285. The Levator Palpebræ Superioris is a very thin Muſcle ſituated in the Orbit above and along the Rectus Superior Oculi. It is fixed to the bottom of the Orbit, by a ſmall narrow Tendon, near the Foramen Opticum, between the poſterior Inſertions of the Rectus Superior, and Obliquus Superior. From thence its fleſhy Fibres run forward on the Rectus, increaſing gradually in breadth, and terminate by a very broad Aponeuroſis, in the Tarſus of the ſuperior Palpebra.

*Orbicularis Palpebrarum.*

286. By the Muſculus Palpebrarum Obliquus we underſtand all that extent of fleſhy Fibres, which by a thin Stratum ſurrounds the Edge of each Orbit, and from thence, without any interruption, covers the two Palpebræ all the way to the Cilia. The Fibres which run upon the Edge of the Orbit are nearly orbicular; but moſt of thoſe which cover the Palpebræ are tranſverſely oval.

287. Almost all of them have a common Tendon ſituated tranſverſely between the internal Angle of the Eye, and the Naſal Apophyſis of the Os Maxillare. This is a ſlender Ligamentary Tendon, ſtrongeſt where it is fixed in the Bone, and diminiſhing gradually as it approaches the Angle of the Palpebræ, where it terminates at the Union of the Points, or at the Extremities of the two Tarſi. The fleſhy Fibres are fixed to it anteriourly, ſo that at firſt ſight it appears to be no more than a Linea Alba.

288. From thence one Portion of the Fibres is turned upward, the other downward, and both meet again at the external Angle, being united by a particular kind of Intertexture, very difficult to be explained. When having inverted this Portion of the Muſcle, we examine its poſterior Surface, we obſerve a ſmall thin Tendinous Rope which runs through the fleſhy Fibres, and divides them all the way from the Union of the two Tarſi, to the Temporal Edge of the Orbit, where it diſappears; the Fibres which lie beyond it appearing to continue the main Circuit of the Muſcle.

289. I divide this Muſcle into four Portions, whereof the firſt is that which ſurrounds the Orbit, and which does not appear to be interrupted toward the Temples; the upper part of it lying between the Supercilia, and the lower part of the Muſculi Frontales. The ſecond Portion is that which lies between the upper Edge of the Orbit and the Globe of the Eye, and which covers the inferior Edge of the Orbit below, ſome of its Fibres being fixed to both Edges of the Orbit. *Riolan* divided this into two ſemi-circular Portions, one ſuperior, the other inferior; the firſt lying between the Muſculus Superciliaris and the lower part of the Muſculus Frontalis, to both which it adheres very much.

290. The third Portion ſeems to belong more particularly to the Palpebræ, and the greateſt part of it is ſpent in the Palpebra Superior. The Fibres of this Portion meet at the two Angles of the Eye, where they appear to make very acute Inflexions without any Diſcontinuation; but when examined on the other ſide next the Globe of the Eye, they have in ſome Subjects appeared to me to be diſtinguiſhed into ſuperior and inferior. The greateſt part of theſe Fibres form a tranſverſely oval Circumference, the ſhorteſt Diameter of which is longer when the Eyes are open than when ſhut.

291. The fourth Portion is an Appendix to the third, from which it differs chiefly in this, that its Fibres do not reach to the Angles, and form only ſmall Arches, the Extremities of which terminate in each Palpebra. This Portion is really divided into two, one for the Edge of the upper

Eyelid, the other for that of the lower. *Riolan* names this Portion, Muſculus Ciliaris.

292. All theſe different Portions of the Orbicular Muſcle adhere to the Skin, which covers it from the upper part of the Noſe to the Temples, and from the Supercilium to the upper part of the Cheek. When they contract, ſeveral Wrinkles are formed in the Skin, which vary according to the different Direction of the Fibres; thoſe under the lower Palpebra are very numerous, and run down very obliquely from before backward.

293. The Skin of the ſuperior Palpebra is folded archwiſe, almoſt in a parallel Direction to that of the ſemioval Fibres, the Plicæ interſecting the Levator; whereas the other Folds only interſect the Orbicularis. The radiated and oblique Plicæ ſeldom appear in young Perſons, except when the firſt and ſecond Portions of the Orbicularis are in Action; but in aged Perſons the marks thereof are viſible at all times.

294. In Man, the ſuperior Palpebra has much more Motion than the inferior. The ſmall ſimple Motions called Twinkling, which frequently happen, though not equally often in all Subjects, are performed in the upper Palpebra, by the alternate Contraction of the Levator and Superior Palpebral Portion of the Muſculus Orbicularis; and in the lower Palpebra at the ſame time or alternately, by the Inferior Palpebral Portion of the Orbicularis; but as there is but a ſmall number of Fibres in this Portion, theſe Motions are but very inconſiderable in this Eyelid.

295. These ſlight Motions, eſpecially thoſe of the upper Palpebra, are not very eaſy to be explained according to the true Structure of the Part. The Motions which wrinkle the Palpebræ, and which are commonly performed to keep one Eye very cloſe ſhut, while we look ſtedfaſtly with the other, are explicable by the ſimple Contraction of all the Portions of the Orbicularis. Theſe Motions likewiſe depreſs the Supercilia, which conſequently may be moved in three different manners, upwards by the Muſculi Frontales, downward by the Orbiculares, and forward by the Superciliares. I ſhall take another occaſion to explain the Difficulties here mentioned.

### §. 9. *The Veſſels of the Eye and of its Appendages.*

296. The external Carotid Artery by means of the Arteria Maxillaris Externa, and the Temporal and Frontal Arteries give ſeveral Ramifications to the Integuments which ſurround the Eye, and to all the Portions of the Muſculus Orbicularis; and theſe Ramifications communicate with thoſe which are diſtributed to the Membrana Conjunctiva Palpebrarum, and to the Caruncula.

297. The ſame external Carotid, by means of the Arteria Maxillaris Interna, ſends a conſiderable Branch into the Orbit through the inferior Orbitary or Spheno-Maxillary Fiſſure; which is diſtributed to the Perioſteum of the Orbit, to the Muſcles of the Globe of the Eye, to the Levator Palpebræ Superioris, to the Fat, Glandula Lacrymalis, Membrana Con-

junctiva both of the Eye and Palpebræ, the Caruncula, &c. It communicates with the internal Carotid, and ſends a ſmall Artery to the Ethmoidal Cells of the Noſe, through the ſmall, internal, poſterior orbitary Hole.

298. The internal carotid Artery having entered the Cranium, ſends off ſmall Rami which accompany the Optic Nerve, and thoſe which paſs through the Fiſſura Spheno-Maxillaris. One of theſe ſmall arterial Branches runs into the Subſtance of the Optic Nerve, and produces on the Retina, the ſmall Arteries which appear very plainly on the inner ſides of that Membrane. The reſt join the Ramifications of the external Carotid already mentioned, and having penetrated into the Subſtance of the Tunica Schlerotica on the backſide, and run for a little way through that Subſtance, they perforate this Coat inwardly in five or ſix places, at an equal diſtance from the Optic Nerve and the Pupilla.

299. Afterwards they perforate the external Lamina of the Choroides in the ſame number of places, and form between that and the internal Lamina, the Vaſa Vorticoſa of *Steno*, and the Vaſcular Stellæ mentioned in the Deſcription of this internal Lamina. Some ſmall vaſcular Filaments from theſe Ramifications, are likewiſe obſerved to adhere very cloſely to the Tunica Vitrea; and before they form the Vaſa Vorticoſa, they ſend ſmall Arteries in a direct courſe to the Circumference of the Uvea, where they form a vaſcular Circle, which ſends out Capillaries as far as the Membrana Cryſtallina, which are very eaſily injected in new born Children.

300. The Veins of all theſe Parts, anſwer nearly to the Arteries. The internal Veins unload themſelves, partly into the internal Jugular Vein, by the Sinus Orbitarii, Cavernoſi, and Petroſi, and partly into the external Jugular Vein by the Vena Angularis, or Maxillaris Externa, the Maxillaris Interna, Temporalis, &c.

301. Besides the Capillary Veſſels, eaſily diſtinguiſhable by the red Colour of the Blood, there are great numbers of thoſe which admit nothing but the ſerous and lymphatic Parts of the Blood, and conſequently do not appear in the natural ſtate. They become viſible in ſome places by Inflammations and Injections, as on the Membrana Conjunctiva of the Eye; but theſe contrivances do not diſcover them every where in aged Perſons. In a Fœtus and in new born Children a fine Injection has ſucceeded ſo well as to diſcover the Veſſels of the Membrana Cryſtallina and Vitrea; and in a Fœtus of about ſix Months, the injected Liquor ſeemed to me to have penetrated a part of the Cryſtalline and Vitreous Humour.

## §. 10. *The Nerves of the Eye and of its Appendages.*

302. I ſhall in this Paragraph repeat and illuſtrate what has been already ſaid in the Deſcription of the Nerves, concerning thoſe of the Eye. Beſides the Optic Nerve already deſcribed, the Globe of the Eye receives ſeveral ſmall ones, which run on each ſide along and about the Optic Nerve, from its entry into the Orbit to its Inſertion in the Globe. Theſe Filaments come

chiefly from a ſmall Lenticular Ganglion, formed by very ſhort Rami of the Orbitary or Ophthalmic Branch of the fifth Pair, and by a Branch of the third Pair, or Motores Oculi.

303. These nervous Filaments of the Lenticular Ganglion having reached the Globe of the Eye, are divided into five or ſix Faſciculi, which having ſurrounded the Optic Nerve, and penetrated and perforated the Cornea Opaca or Sclerotica, run at diſtances more or leſs equal, between the Sclerotica and Choroides towards the Uvea. There, each of them is divided into ſeveral ſhort Filaments, which terminate in the Subſtance of the Uvea. Theſe ſmall Nerves which run from behind forward between the Sclerotica and the Choroides, have formerly been taken for particular Ligaments, by very great Anatomiſts.

304. The Nerves which go to the other Parts belonging to the Eye, come from the third, fourth, ſixth and firſt two Branches of the fifth Pair of Nerves of the Medulla Oblongata, and likewiſe from the Portio Dura of the ſeventh Pair. The third, fourth and ſixth Pairs give Nerves to the Muſcles of the Globe of the Eye. The two Branches of the fifth Pair, and the Portio Dura of the ſeventh, give Nerves not only to the other parts which ſurround the Globe, but alſo to the Muſculi Frontales and internal Parts of the Noſe.

305. The Trunk of the third Pair or Motores Oculi, having entered the Orbit through the ſuperior orbitary or ſphenoidal Fiſſure, produces four Branches. The firſt runs upward and divides into two, one for the Muſculus Rectus Superior, and the other for the Levator Palpebræ Superioris. The Trunk continuing its courſe, gives off the ſecond ſhort Branch to the Rectus Inferior. The third Branch is long and goes to the Obliquus Inferior, contributing likewiſe to the formation of the Lenticular Ganglion already mentioned. The fourth Branch is large and ſupplies the Rectus Internus.

306. The firſt Branch of the fifth Pair, commonly termed Nervus Ophthalmicus, divides into three Rami, as it enters the Orbit; and ſometimes only into two, one of which is afterwards ſubdivided. Of theſe three Branches one is ſuperior, which I term Nervus Superciliaris; one internal, termed Naſalis, and one external, to which the name of Temporalis agrees better than that of Lacrymalis, which may occaſion a miſtake.

307. The Superior or Superciliary Ramus runs along the whole Perioſteum of the Orbit, and having paſſed through the ſuperciliary Notch or Foramen of the Os Frontis, is diſtributed to the Muſculus Frontalis, Superciliaris, and ſuperior Portion of the Orbicularis Palpebrarum; and it communicates with a ſmall Branch of the Portio Dura of the ſeventh Pair.

308. The Internal or Naſal Branch paſſes under the Ramification of the Nerve of the third Pair, and running toward the Noſe, is diſtributed thereto, and to the neighbouring parts of the Orbicularis, the Caruncula, &c. This Branch ſends off a Filament, which paſſing through the internal, anterior, orbitary Hole, enters the Cranium, and preſently returns again through one of the Ethmoidal Holes, to the internal Parts

of the Noſe. I have ſometimes obſerved this Naſal Ramus to communicate with the Ramus Superciliaris by a particular Arch, before it enters the Orbitary Hole.

309. The External or Temporal Ramus, which is ſometimes a Subdiviſion of the Superciliaris, is diſtributed to the Glandula Lacrymalis, and ſends off a Filament which pierces the Orbitary Apophyſis of the Os Malæ.

310. The ſecond Branch of the fifth Pair, called Nervus Maxillaris Superior, ſends off a Ramus through the bony Canal of the lower part of the Orbit, which going out at the anterior inferior orbitary Hole, is diſtributed to the neighbouring Portion of the Muſculus Orbicularis, and communicates with a Ramus of the Portio Dura. I ſhall here ſay nothing of the other Diſtributions of this Branch of the Maxillaris Superior.

311. The Portio Dura of the ſeventh Pair or Auditory Nerve, which I call Nervus Sympatheticus Minor, gives Branches to the ſuperior, inferior, and external lateral parts of the Orbicularis Palpebrarum, one of which communicates with the Nervus Superciliaris, and another with the Sub-Orbitarius, as I obſerved in the Deſcription of the Nerves.

## §. 11. *The Uſes of the Eye and of its Appendages in general.*

312. Every Body knows that the Eye is the Organ of Viſion. The tranſparent parts of the Globe modify the Rays of Light, by different Refractions; the Retina and Choroides receive the different Impreſſions of theſe Rays; and the Optic Nerve carries theſe Impreſſions to the Brain. When Objects are at a great diſtance or obſcure, the Pupilla is dilated; and it is contracted when Objects are near, or placed in a great Light. The Muſcles of the Globe of the Eye and of the Palpebræ perform the Motions already deſcribed.

313. The Glandula Lacrymalis continually moiſtens the forepart of the Globe of the Eye; and the Lacrymal Serum is equally ſpread over that Globe by the Motions of the ſuperior Palpebra, the inner Surface of which is in a ſmall meaſure Villous. The Union of the two Palpebræ directs this Serum towards the Puncta Lacrymalia; and the unctuous Matter diſcharged through the Foramina Ciliaria hinders it from running out between the Palpebræ. The large Size and viſcid Surface of the Caruncula prevents it from running beyond the Puncta, and thus forces it into them.

314. The Supercilia may hinder Sweat from falling on the Eyes. The ſuperior Cilia, which are longer than the inferior, may have the ſame Uſe, and they both ſerve to prevent Duſt, Inſects, &c. from entering the Eyes when they are only a little open.

## ART. III.

### *The Noſe.*

*Diviſion.*

315. THE Parts of which the Noſe is made up, may be divided two different ways, viz. from their Situation, into internal and external Parts; and from their Structure, into hard and ſoft Parts.

316. The external Parts are the Root of the Noſe, the Arch, the Back, or Spine of the Noſe, the Sides of the Noſe or of the Arch, the Tip of the Noſe, the Alæ, the external Nares, and the Part under the Septum.

317. The internal Parts are the internal Nares, the Septum Narium, the Circumvolutions, the Conchæ Superiores, the Conchæ Inferiores, the poſterior Openings of the internal Nares, the Sinus Frontales, Sinus Maxillares, Sinus Sphenoidales, the Ductus Lacrymales, and Ductus Palatini.

318. The firm or hard Parts are moſtly bony, and the reſt, Cartilaginous, viz. the Os Frontis, Os Ethmoides, Os Sphenoides, Oſſa Maxillaria, Oſſa Naſi, Oſſa Unguis, Oſſa Palati, Vomer, Conchæ Inferiores, and the Cartilages. To theſe we may add the Perioſteum and Perichondrium, as Parts belonging to the Bones and Cartilages.

319. The ſoft Parts are the Integuments, Muſcles, Sacculus Lacrymalis, Membrana Pituitaria, Veſſels, Nerves, and Hairs of the Nares. The bony Parts have been all explained in the Deſcription of the Skeleton; and therefore I need only in this place ſet down the Diſtribution and Diſpoſition thereof, for the formation of ſome of the principal Parts. The Septum is formed by the deſcending Lamina of the Os Ethmoides, and by the Vomer; and it is placed in the Groove framed by the Criſtæ of the Oſſa Maxillaria, and riſing Edges of the Oſſa Palati deſcribed in Sect. 1. N° 279, 316. The Back of the Noſe is formed by the Oſſa Naſi, and the Sides, by the ſuperior Apophyſes of the Oſſa Maxillaria.

320. The internal Nares, or the two Cavities of the Noſe, comprehend the whole Space between the external Nares and poſterior Openings, immediately above the Arch of the Palate, from whence theſe Cavities reach upward as far as the Lamina Cribroſa of the Os Ethmoides, where they communicate forward, with the Sinus Frontales, and backward, with the Sinus Sphenoidales. Laterally, theſe Cavities are bounded on the inſide by the Septum Narium, and on the outſide or that next the Cheeks, by the Conchæ, between which they communicate with the Sinus Maxillaris.

321. The particular Situation of theſe Cavities deſerves our attention. The bottom of them runs directly backward, ſo that a ſtreight and pretty large Stilet, may eaſily be paſſed from the external Nares, under the great Apophyſis of the Occipital Bone. The Openings of the Maxillary Sinuſes, are nearly oppoſite to the upper Edge of the Oſſa Malarum. The Openings of the Frontal Sinuſes are more or leſs oppoſite to, and between the

the Pulleys or Rings of the Muſculi Trochleares; and by theſe Marks, the Situation of all the other Parts may be determined.

322. The inferior Portion of the external Noſe, is compoſed of ſeveral Cartilages, which are commonly five in number, and of a pretty regular Figure. The reſt are only additional, ſmaller, more irregular, and the number of them more uncertain. Of the five ordinary Cartilages one is ſituated in the middle, the other four laterally. The middle Cartilage is the moſt conſiderable, and ſupports the reſt, being connected immediately to the bony Parts; but the other four are connected to the middle Cartilage, and to each other, by Means of Ligaments.

323. The principal Cartilage of the Noſe conſiſts of three Parts, one middle and two lateral. The middle Portion is a broad Cartilaginous Lamina, joined by a kind of Symphyſis, to the anterior Edge of the middle Lamina of the Os Ethmoides, to the anterior Edge of the Vomer, and to the anterior Part of the Grooves formed by the Oſſa Maxillaria, as far as the Naſal Spines of theſe Bones. This Lamina compleats the Septum Narium, and indeed, forms the principal part thereof.

324. The lateral Portions are oblique and narrow, ſuited to the correſponding parts of the bony Arch. Where they join the middle Lamina, a ſuperficial Groove is obſervable, which makes them ſometimes appear like two diſtinct Pieces, ſeparated from the Lamina, though they are really continuous. This ſhallow Groove terminates below by a ſmall Criſta.

325. The lateral Cartilages are two, on each ſide of the inferior Part of the Lamina, one anterior, the other poſterior. The two anterior Cartilages are very much bent forward, and form what is called the Tip of the Noſe; the Space between their incurvated Extremities being commonly filled with a kind of fatty Subſtance. The two poſterior Cartilages form the Alæ of the Nares, being pretty broad and of an irregular Figure.

326. The Spaces left between ſome Portions of the anterior and poſterior Cartilages, thoſe between the poſterior Cartilages and the neighbouring parts of the Oſſa Maxillaria; and laſtly, thoſe between theſe four lateral Cartilages and the principal Lamina, vary in different Subjects, and are filled by ſmall additional Cartilages, the Number, Size and Figure of which are as variable as the Interſtices in which they lie.

327. The Sub-Septum or Portion under the Septum Narium, is a Pillar of Fat applied to the inferior Edge of the Cartilaginous Partition, in form of a ſoft, moveable Appendix. The thickneſs of the Alæ Narium, and eſpecially that of their lower Edges, is not owing to the Cartilages which are very thin, but to the ſame kind of ſolid Fat with which theſe Cartilages are covered. The great Cartilage is immoveable by reaſon of its firm Connexion to the bony parts of the Noſe; but the lateral Cartilages are moveable, becauſe of their Ligamentary Connexions, and they are moved in different manners by the Muſcles belonging to them.

328. The external Noſe is covered by the common Integuments, the Skin, Epidermis and Fat. Theſe which cover the Tip of the Noſe and

Alæ Narium are a great number of glandular Bodies, called Glandulæ Sebaceæ by *M. Morgagni*, the Contents of which may eaſily be ſqueezed out by the Fingers. All theſe bony and cartilaginous Parts have likewiſe the common Perioſteum or Perichondrium.

*Muſcles of the Noſe.*

329. Six Muſcles are commonly reckoned to belong to the Noſe; two Recti, called alſo Pyramidales or Triangulares; two Obliqui or Laterales, and two Tranſverſi or Myrtiformes. In very Muſcular Bodies there are likewiſe ſome ſupernumerary Muſcles or ſmall Acceſſorii. The Noſe may alſo be moved in ſome meaſure by the Muſcles of the Lips, which in many Caſes become Aſſiſtants to the proper Muſcles of this Organ.

330. The Muſculus Pyramidalis or Anterior on each ſide, is inſerted by one Extremity, in the Synarthroſis of the Os Frontis and Oſſa Naſi, where its fleſhy Fibres mix with thoſe of the Muſculi Frontales and Superciliares. It is very flat, and runs down on the ſide of the Noſe, increaſing gradually in breadth, and terminating by an Aponeuroſis, which repreſents the Baſis of a Pyramid, and is inſerted in the moveable Cartilage which forms the Ala of the Nares.

331. The oblique or lateral Muſcle is a thin, fleſhy Plane, lying on the ſide of the former, and in ſome Subjects, appearing to form one broad Muſcle with it. This is probably the reaſon why the anterior Muſcle has been termed Triangularis. The lateral Muſcle is fixed by its upper Extremity to the Apophyſis Naſalis of the Os Maxillare, below its Articulation with the Os Frontis, and ſometimes a little lower than the middle of the inner Edge of the Orbit. From thence it runs toward the Ala Narium, and is inſerted in the moveable Cartilage, near the Os Maxillare, being covered laterally by a Portion of the neighbouring Muſcle of the upper Lip, with which, in ſome Subjects, it appears to be confounded.

332. The tranſverſe or inferior Muſcle, called alſo Myrtiformis, is inſerted by one end in the Os Maxillare, near the lower Edge of the Orbit, much about the place which anſwers to the Extremity of the Socket of the Dens Caninus on the ſame ſide. From thence it runs almoſt tranſverſely upward, and is fixed in the lateral Cartilages of the Noſe, over which, in ſome Subjects, it ſeems to run to the Alæ of the great Cartilage, and to be inſerted there.

333. The firſt two Pairs of theſe Muſcles, raiſe and dilate the Alæ of the Nares, when they act; and at the ſame time, raiſe the upper Lip, by reaſon of their Connection with the Muſcles of that Part. They likewiſe wrinkle the Skin on the ſides of the Noſe.

*Membrana Pituitaria.*

334. The Membrana Pituitaria is that which lines the whole internal Nares, the cellular Convolutions, the Conchæ, the ſides of the Septum Narium, and by an uninterrupted Continuation, the inner Surface of the Sinus Frontales and Maxillares, and of the Ductus Lacrymales, Palatini and Sphenoidales. It is likewiſe continued down from the Nares to the Pharynx, Septum Palati, &c. as we ſhall ſhew hereafter.

335. It is termed Pituitaria, becauſe through the greateſt part of its large extent, it ſerves to ſeparate from the arterial Blood, a Mucilaginous

Lympha, called Pituita by the Ancients, which in the natural ſtate is pretty liquid; but it is ſubject to very great changes, becoming ſometimes glutinous or ſnotty, ſometimes limpid, &c. neither is it ſeparated in equal quantities through the whole Membrane.

336. When we carefully examine this Membrane, it appears to be of a different Structure in different Parts. Near the Edge of the external Nares it is very thin, appearing to be the Skin and Epidermis in a degenerated ſtate. All the other Parts of it in general, are ſpungy and of different thickneſſes. The thickeſt parts are thoſe on the Septum Narium, on the whole lower Portion of the internal Nares, and on the Conchæ; and if we make a ſmall Hole in it, at any of theſe places, and then blow through a Pipe, we diſcover a very large cellular Subſtance. In the Sinuſes it appears to be of a more ſlender Texture.

337. On the ſide next the Perioſteum and Perichondrium, it is plentifully ſtored with ſmall Glands, the Excretory Ducts of which are very long near the Septum Narium, and their Orifices very viſible; and by applying a Pipe to any of theſe Orifices, the Ducts may be blown up almoſt through their whole extent; but in order to this, the Parts muſt firſt be very well cleaned and waſhed in lukewarm Water.

338. In theſe places eſpecially, we likewiſe diſcover a very fine villous Subſtance, when the Parts are examined in clear Water in the manner which I have deſcribed in another place, and which I have uſed in my public Courſes, for above twenty Years paſt. *Riolan* made uſe of this Method in examining ſmall Fœtuſes.

*Sinus.* 339. The Frontal, Maxillary and Sphenoidal Sinuſes open into the internal Nares, but in different manners. The Frontal Sinuſes open from above downwards, anſwering to the Infundibula of the Os Ethmoides, deſcribed in the Hiſtory of the Skeleton. The Sphenoidales open forwards oppoſite to the poſterior Orifices of the Nares, and the Maxillares open a little higher, between the two Conchæ. Therefore the Sinus Frontales diſcharge themſelves moſt readily when we ſtand or ſit; and the Sphenoidales, when the Head is inclined forward.

340. The Sinus Maxillares cannot be emptied wholly, or both at the ſame time in any one Situation. Their Opening, which in ſome Subjects is ſingle, in others double, &c. lies exactly between the two Conchæ, about the middle of their depth; ſo that when the Head is held ſtreight, or inclined forward or backward, they can only be half emptied; but when we lie on one ſide, the Sinus of the oppoſite ſide may be wholly emptied, the other remaining full.

341. It is proper here to obſerve the whole extent of the Maxillary Sinus. Below, there is but a very thin Partition between it and the Dentes Molares, the Roots of which, do, in ſome Subjects, perforate that Septum. Above, there is only a very thin tranſparent Lamina between the Orbit and the Sinus. Backward, above the Tuberoſity of the Os Maxillare, the ſides of the Sinus are very thin, eſpecially at the place which lies before the Root of the Apophyſis Pterygoides, through which the inferior

Maxillary Nerve ſends down a Ramus to the Foramen Palatinum Poſterius, commonly called Guſtatorium. Inward, or toward the Conchæ Narium, the bony part of the Sinus is likewiſe very thin.

*Sacculus Lacrymalis.*

342. The Lacrymal Sacculus is an oblong membranous Bag into which the ſerous Fluid is diſcharged from the Eye through the Puncta Lacrymalia, already deſcribed, and from which the ſame fluid paſſes to the lower part of the internal Nares. It is ſituated in a bony Groove and Canal, formed partly by the Apophyſis Naſalis of the Os Maxillare and Os Unguis, partly by the ſame Os Maxillare and lower part of the Os Unguis, and partly by this lower Portion of the Os Unguis, and a ſmall ſuperior Portion of the Concha Narium Inferior. This Groove and Canal are the bony Lacrymal Duct, about which, I would adviſe Beginners to conſult what was ſaid in the Deſcription of the Skeleton.

343. I have an Obſervation or two to add in this place concerning the Situation of this bony Duct. It runs down for a little way obliquely backward, toward the lower and lateral part of the internal Nares on each ſide, where its lower Extremity opens on one ſide of the Sinus Maxillaris under the inferior Concha, nearly at the place from which a perpendicular Line would fall in the Interſtice between the ſecond and third Dentes Molares. The upper part of this Duct is only an half Canal or Groove; the lower is a compleat Canal narrrower than the former.

344. The Sacculus Lacrymalis may be divided into a ſuperior or orbitary Portion, and an inferior or naſal Portion. The orbitary Portion fills the whole bony Groove, being ſituated immediately behind the middle Tendon of the Muſculus Orbicularis. About one fourth of its length is above this Tendon, and the reſt below. The Naſal Portion lies in the bony Canal of the Noſe, being narrower and ſhorter than the former.

345. The orbitary Portion is diſpoſed at its upper Extremity, much in the manner of an Inteſtinum Cæcum, and at the lower Extremity is continued with the Portio Naſalis. Towards the internal Angle of the Eye, behind the Tendon of the orbicular Muſcle, it is perforated by a ſmall ſhort Canal formed by the Union of the Lacrymal Ducts.

346 The Naſal Portion having reached the lower part of the bony Duct under the inferior Concha, terminates in a ſmall flat membranous Bag, the bottom of which is perforated by a round Opening, as I have always found it upon a careful Examination, but which at firſt ſight appears oblong.

347. I uſed to attribute this difference to the force which I was obliged to uſe in ſeparating the Concha Inferior, in order to ſee this Opening, which I have often found more backward than the middle of the Bag at the Extremity of this Portion; and therefore when I would either ſee or ſhew this Opening in its natural ſtate, I do not ſeparate the Inferior Concha, but cut it gently with a ſharp Knife, or with Sciſſars. If a tranſverſe Line be drawn between the lower part of the Noſe and Os Malæ, and another Line be drawn directly upward, oppoſite to the third Dens Molaris

or oppoſite to the ſecond and third, theſe two Lines will interſect each other nearly at the lower Extremity of this Sacculus.

348. I have ſometimes found the upper Extremity of this Bag divided into an interior and poſterior part, by a kind of Valvula Connivens lying in the anterior Portion, a little lower than the Tendon of the Muſculus Orbicularis. The ſmall common Canal of the two Lacrymal Ducts opens in the poſterior Portion, and conſequently behind the Valve.

349. The Subſtance of this Sacculus is ſomething ſpungy or cellulous, and pretty thick, being ſtrongly united by its convex ſide to the Perioſteum of the bony Canal, which may be diſtinctly ſhewn. This Subſtance ſeems to be made up of two Laminæ, joined together by a ſpungy Membrane, the outermoſt of which is that which I have mentioned; the other appears to be glandulous, and is in ſome Subjects looſe and pliable, which I look upon as a Diſeaſe.

*Ductus Inciſorii.*

350. The Ductus Inciſorii, or Naſo-Palatini of *Steno*, are two Canals which go from the bottom of the internal Nares croſs the Arch of the Palate, and open behind the firſt or largeſt Dentes Inciſorii. Their two Orifices may be diſtinctly ſeen in the Skeleton at the lower part of the Naſal Foſſæ, on the anterior and lateral ſides of the Criſtæ Maxillares; and we may likewiſe perceive their oblique Paſſage through the Maxillary Bones, and laſtly their inferior Orifices in a ſmall Cavity or Foſſula, called Foramen Palatinum Anterius. In freſh Subjects they are not ſo apparent, eſpecially in Human Subjects, for in Sheep and Oxen they are eaſily diſcoverable.

351. *Santorini* in his Anatomical Obſervations has deſcribed thoſe of the Human Body in a very pretty manner, and has given us his method of diſcovering them, which is nearly the ſame with that which I have always made uſe of in my private Courſes, to ſhew at one view all the external parts which belong to the Noſe, as may be ſeen in the Works publiſhed by my Scholars, eſpecially Strangers. I ſay his Method is nearly the ſame with mine, becauſe inſtead of dividing the Head into two equal lateral parts, I always direct the Saw a little toward one ſide, to preſerve the Septum Narium intire, as well as that of the Sinus Frontales, Sinus Sphenoidales, and Ductus Inciſorii; and on the other ſide, to preſerve the Conchæ and Cells of the Os Ethmoides. For this purpoſe I uſe a very fine Saw made of the Spring of a Watch.

352. By this Method I ſhew on that ſide from which all the Septa have been ſawed off, the intire Conchæ, their convex ſides, the particular thickneſs of the Membrana Pituitaria on their lower Edges, the Orifice or Orifices of the Sinus Maxillaris, the Situation of the Orifice of the Sinus Sphenoidalis, the communicating Ducts that go between the Sinus Frontales and the Ethmoidal Cells, and Interſtices between the two Conchæ, and the Structure of the poſterior Openings of the Nares. I can ſhew likewiſe at the ſame time the Orifice of the *Euſtachian* Tube behind the poſterior Opening of the Nares, and the Communication of the Noſe with the Mouth.

353. On the ſame ſide, I afterwards ſeparate gradually with a very ſharp Knife, or with narrow ſharp pointed Sciſſars, the Superior or Ethmoidal Concha, without doing any Violence to the neighbouring parts; and then I can ſhew on the parts covered by that Concha, a little oblong or oval Foſſula which runs down obliquely from before backward; at the poſterior and lower Extremity of which, there is an Orifice of about a Quarter of an Inch in Diameter, which opens into the Maxillary Sinus; and another at the anterior or ſuperior Extremity which opens into the Frontal Sinus.

354. Immediately behind this Foſſula, there are two Openings, one into the Sinus Frontales, the other into the Ethmoidal Cellulæ of the Os Frontis. I ſhew likewiſe in the poſterior part of the Os Ethmoides, at leaſt two Openings, by which the Cells of that Bone communicate with each other. All this is very different from what we ſee in the Skeleton, or even when theſe parts are deprived of their Membranes, &c. neither is the Structure always the ſame in freſh Subjects; for in ſome I have obſerved, a little before and above the Opening of the Maxillary Sinus, two ſmall Grooves, which united in their paſſage to the Frontal Sinuſes, the uppermoſt Groove being a little contorted.

355. In the next place I remove the Concha Inferior or Maxillaris in the ſame manner and with the ſame precautions; and then I obſerve, at the diſtance of about a quarter of an Inch from the anterior Extremity of this Concha, a ſmall Opening, the Diameter of which is not above the twelfth part of an Inch, and is turned obliquely backward. It ſeems to be the Extremity of a Duct of the ſame Diameter, but when it is ſlit with ſharp pointed Sciſſars, we diſcover a flat oval Cavity, the Diameter of which is a quarter of an Inch in length, and lies in the ſame Direction with the Septum Narium.

356. This oval Cavity is the lower Extremity of the Sacculus Lacrymalis, which conſequently is only contracted between this inferior Cavity and the orbitary Portion. Within this narrow or contracted Portion we ſee likewiſe the Opening of a blind Duct, which runs obliquely backward and upward for about a quarter of an Inch; but I do not know preciſely where it terminates or for what it is deſigned.

357. The Arteries of all theſe Parts come from the external Carotid. Thoſe of the external parts of the Noſe are chiefly Branches and Rami of the Arteria Maxillaris Externa or Angularis, and of the Temporalis; and the Arteries of the internal parts are Branches and Ramifications of the Maxillaris Interna. The Veins are almoſt in the ſame manner, Branches and Ramifications of the external Jugular, and they communicate with the orbitary Sinus, and by that means, with the Sinuſes of the Dura Mater, and with the internal Jugulars. *Arteries and Veins.*

358. The principal Nerves belonging to the Noſe are Filaments of the Nervi Olfactorii, which run down through the Holes of the tranſverſe Lamina of the Os Ethmoides, and are diſtributed to the common Membrane of the internal Nares, eſpecially to the villous Portions thereof. The *Nerves,*

inner Ramus of the orbitary or ophthalmic Nerve ſends a Filament through the internal anterior orbitary Hole into the Cranium, which comes out again in company with one of the Filaments of the Olfactory Nerve through the Ethmoidal Lamina.

359. This internal Ramus advances afterwards toward the Os Unguis, and is diſtributed partly to the Sacculus Lacrymalis, partly to the upper Portion of the Muſculus Pyramidalis, and of the Integuments of the Noſe. The Sub-orbitary Nerve which is a Branch of the Maxillaris Superior, having paſſed through the inferior orbitary Hole, ſends Filaments to the lateral external parts of the Noſe. Another Ramus of the ſuperior Maxillary Nerve goes to the poſterior Opening of the Nares, being ſpent on the Conchæ, and other internal parts of the Noſe.

*Uſes.* 360. The Noſe is the Organ of Smelling, by means of the villous Portion of the internal Membrane, to which the Olfactory Nerves are chiefly diſtributed. It is likewiſe of uſe in Reſpiration, and the Mucilaginous Fluid ſpread over the whole Pituitary Membrane, prevents the Air from drying that Membrane, and ſo rendring it incapable of being affected. The Noſe ſerves likewiſe to regulate and modify the Voice, and to this the Sinuſes likewiſe contribute. The Sacculus Lacrymalis receives the Serum from the Eyes, and diſcharges it upon the Palate from whence the greateſt part of it runs to the Pharynx.

## ART. IV.

### *The Ear.*

*The Ear in general.* 361. EVERY one knows that the Ears are two in number, that they are ſituated in the lateral parts of the Head, and that they are the Organs of Hearing. Anatomiſts commonly divide or diminiſh the Ear into external and internal. By the external Ear they mean all that lies without the external Orifice of the Meatus Auditorius in the Os Temporis; and by the internal Ear, all that lies within the Cavities of that Bone, and alſo the Parts that bear any relation thereto.

362. The greateſt part of the external Ear conſiſts of a large Cartilage very artificially framed, which is the Baſis of all the other parts of which this Portion of the Ear is made up. The internal Ear conſiſts chiefly of ſeveral bony Pieces, partly formed in the Subſtance of the Oſſa Temporum, and eſpecially in that Portion of it, called Apophyſis Petroſa, and partly ſeparated from, but contained in a particular Cavity of that Bone. All theſe bony Pieces have been explained in the Deſcription of the Skeleton, to which I muſt therefore refer, deſiring thoſe who have a mind to underſtand what I am now to ſay about the other parts of this Organ, carefully to reviſe the Explication there given.

*The External Ear.*

363. The external Ear taken all together reſembles in ſome degree the Shell of a Muſcle, with its broad end turned upward, the ſmall end downward, the convex ſide next the Head, and the concave ſide outward. Two Portions are diſtinguiſhed in the external Ear taken all together, one large and ſolid, called in Latin Pinna, which is the Superior, and by much the greateſt part; the other ſmall and ſoft called the Lobe, which makes the lower part. We may likewiſe conſider two ſides in the outward Ear, one turned obliquely forward and irregularly concave, the other turned obliquely backward, and unequally convex; for all Ears which have not been diſordered by binding the Head too tight in Childhood, are naturally bent forward.

364. The foreſide is divided into Eminences and Cavities. The Eminences are four in number, called Helix, Anthelix, Tragus, and Antitragus. The Helix is the large folded Border or Circumference of the great Portion of the Ear. The Anthelix is the large oblong Eminence or Riſing ſurrounded by the Helix. The Tragus is the ſmall anterior Protuberance below the anterior Extremity of the Helix, which in an advanced Age is covered with Hairs. The Antitragus is the poſterior Tubercle, below the inferior Extremity of the Anthelix.

365. The Cavities on the foreſide are four in number, the Hollow of the Helix, the Depreſſion at the ſuperior Extremity of the Anthelix, called Foſſa Navicularis, the Concha or great double Cavity that lies under the Riſing termed Anthelix, the upper bottom of which is diſtinguiſhed from the lower by a Continuation of the Helix in form of a tranſverſe Criſta: and laſtly, the Meatus of the external Ear ſituated at the lower part of the bottom of the Concha.

366. The backſide of the external Ear ſhews only one conſiderable Eminence which is a Portion of the convex ſide of the Concha, the other Portion being hid by the Adheſion of the Ear to the Os Temporis. This Adheſion hinders us likewiſe from ſeeing the Hollow anſwering to the Criſta, by which the Cavity of the Concha is divided.

367. I have already ſaid that the external Ear conſiſts chiefly of a Cartilage, which is the Baſis of all the other Parts. Theſe other Parts are Ligaments, Muſcles, Integuments, Sebaceous and Ceruminous Glands, Arteries, Veins and Nerves; but I do not reckon among them a large Gland, called by the Greeks Parotis, becauſe it lies very near the Ear; the Deſcription of which muſt be referred to that of the Salivary Glands, of which it is the moſt conſiderable.

368. The Cartilage of the outward Ear is nearly of the ſame Extent and Figure with the large ſolid Portion thereof, already mentioned; but it is not of the ſame thickneſs, being covered by Integuments on both ſides. In the Lobe or ſoft lower Portion of the Ear, this Cartilage is wanting. On the backſide, it ſhews all the Eminences and Cavities on the foreſide in an oppoſite Situation with reſpect to each other, except the Fold of the great Circumference; and it conſiſts only of one piece from that Circumference all the way to the Meatus Externus, except at the two Extremities

ties of the folded part of the Helix, where there are two ſmall ſeparate Portions connected to the great Cartilage only by the Integuments.

369. The cartilaginous Portion of the external Meatus Auditorius does not make a compleat Circle; but rather a ſhort Tube in one ſide of which there is a Break, and which terminates in an oblique Border fixed to the Edge of the bony Canal by ſeveral ſmall Inequalities, as by a kind of Ingrailing; and from this Obliquity it is, that the cartilaginous Border terminates downward in a kind of Apex or Point. The lateral Break in this Cartilage is between the upper and back part of its Circumference; and on each ſide thereof the Cartilaginous Edges are rounded. There are likewiſe two or three other ſmall Inciſures in this Circumference, which in regard to the Meatus, repreſent obliquely tranſverſe Fiſſures. The anterior Fiſſure is in a manner Quadrangular; neither are the intermediate parts always oppoſite to each other, for the uppermoſt is a little further from the Os Temporis than the poſterior.

370. The external Ear is fixed to the Cranium, not only by the Cartilaginous Portion of the Meatus already mentioned, but alſo by Ligaments which are two in number, one anterior, the other poſterior. The anterior Ligament is fixed by one Extremity to the Root of the Apophyſis Zygomatica of the Os Temporis, at the anterior and a little toward the ſuperior part of the Meatus Oſſeus, cloſe to the Corner of the Glenoide Cavity; and by the other Extremity, to the anterior and ſuperior part of the Cartilaginous Meatus.

371. The poſterior Ligament is fixed by one end to the Root of the Maſtoide Apophyſis, and by the other, to the poſterior part of the Convexity of the Concha, ſo that it is oppoſite to the anterior Ligament. There is likewiſe a kind of ſuperior Ligament, which ſeems to be only a Continuation of the Aponeuroſis of the Frontal and Occipital Muſcles.

372. Of the Muſcles of the external Ear, ſome go between the Cartilages and the Os Temporis, others are confined to the Cartilages alone. Both kinds vary in different Subjects, and are ſometimes ſo very thin, as to look more like Ligaments than Muſcles. The Muſcles of the firſt kind are generally three in number, one Superior, one Poſterior, and one Anterior, and they are all very thin. The ſuperior Muſcle is fixed in the Convexity of the Foſſa Navicularis, and of the ſuperior Portion of the Concha; from whence it runs up to the ſquammous Portion of the Os Temporis, expanding in a radiated manner, though not in the ſame degrees in all Subjects, and is inſerted principally in the Ligamentary Aponeuroſis, which covers the poſterior Portion of the Temporal Muſcle.

373. The anterior Muſcle is ſmall, more or leſs inverted, and like an Appendix to the ſuperior. It is fixed by one Extremity above the Root of the Zygomatic Apophyſis, and by the other, in the anterior part of the Convexity of the Concha.

374. The poſterior Muſcle is almoſt tranſverſe, and of a conſiderable breadth, being fixed by one end to the poſterior part of the Convexity of the Concha, and by the other, in the Root of the Maſtoide Apophyſis.

It covers the poſterior Ligament, but the diviſion of it into ſeveral Portions mentioned by ſome Authors, ſeems to be meerly artificial, that is, owing to Diſſection.

375. The ſmall Muſcles which are confined to the Cartilages are only ſmall Strata of Fibres found on both ſides of the Cartilages. In many Subjects they are of ſo pale a Colour, as not to look at all like Muſcular Fibres. Of this number are thoſe which *Valſalva* diſcovered in the different Cavities on the backſide of the Cartilage, and thoſe found by *Santorini* on the Tragus, and along the convex part of the anterior Portion of the Helix.

376. The Skin of the external Ear is in general, a Continuation of that which covers the neighbouring parts of the Temporal Region. The Skin on the foreſide of the Ear is accompanied by a very ſmall quantity of cellular Subſtance, and therefore we find all the Eminences and Cavities of that ſide diſtinctly mark'd upon it, as far as the bottom of the external Meatus Auditorius. In what I have ſaid of the Skin the Epidermis is likewiſe comprehended.

377. The backſide is covered by the Skin continued from the foreſide; but as the Folds are there very cloſe, it only paſſes over them, except that Portion of the Concha which ſurrounds the Entry of the Meatus Auditorius, and which is joined to the Os Temporis by means of the cellular Subſtance. The Hollow of that common Fold which lies between the Anthelix and Concha does not appear on the backſide, for as it is filled with cellular Subſtance, the Skin paſſes over it.

378. The Lobe of the Ear, or that ſoft Portion which lies under the Tragus, Antitragus, and Meatus Auditorius, is made up of nothing but Skin and cellular Subſtance. The Meatus Auditorius is partly Bony and partly Cartilaginous. The bony Portion is the longeſt, and forms the bottom of the Canal, as may be ſeen in the Deſcription of the Skeleton. The cartilaginous Portion is the ſhorteſt, and in Adults, forms the external Opening or Orifice of the Canal, as has been already ſaid.

379. These two Portions joined endwiſe to each other, form a Canal of about three Quarters of an Inch in length, of different Wideneſs in its different Parts, and a little contorted. It is lined on the inſide by the Skin and cellular Membrane, through its whole length; and thus theſe Integuments make up for the Breaks in the Cartilaginous Portion, and form a kind of cutaneous Tube in the other Portion. The cellular Membrane is confounded with the Perichondrium and Perioſteum of the Meatus.

380. The Skin which covers both ſides of the Cartilage contains a great number of ſmall Glands, which continually diſcharge an oily whitiſh Humour collected chiefly near the Adheſions of the Ear to the Head, and under the Fold of the Helix; and theſe Glands are of the ſebaceous kind. The Skin which lines the Meatus Auditorius contains another kind of Glands, of a yellowiſh Colour, and which may be plainly ſeen on the convex ſide of the cutaneous Tube already mentioned.

381. These Glands are diſpoſed in ſuch a manner as to leave reticular Spaces between them, and they penetrate a little way into the Subſtance of the Skin. They are called Glandulæ Ceruminoſæ, becauſe they diſcharge that Matter which is named Cerumen, or the Wax of the Ear. The inner Surface of the cutaneous Tube is full of fine Hairs, between which lie the Orifices of the Ceruminous Glands. The firſt place in which we meet with theſe Glands is on that part of the convex ſide of the cutaneous Tube, which ſupplies the Breaks of the Cartilaginous Meatus.

382. The Arteries of the external Ear come anteriourly from the Arteria Temporalis, and poſteriourly from the Occipitalis, which is a Branch of the external Carotid. It is proper to obſerve here that the Occipital Artery communicates with the Vertebralis, and thereby with the internal Carotid. The Veins are Rami of the Jugularis Externa; and the Occipital Vein, one of theſe Rami, communicates not only with the Vena Vertebralis, but with the neighbouring lateral Sinus of the Dura Mater.

383. The Portio Dura of the Auditory Nerve have paſſed out of the Cranium through the Foramen Stylo-Maſtoidæum in the manner that ſhall be afterwards deſcribed, gives off a Ramus which runs up behind the Ear, to the backſide of which it ſends ſeveral Filaments; and the Trunk of this Ramus ſends likewiſe Filaments to the Meatus and foreſide of the Ear. The ſecond vertebral Pair ſends alſo a Ramus to the Ear, the Ramifications of which communicate with thoſe of the other Ramus from the Portio Dura.

*The Internal Ear.*

384. I muſt here begin by repeating the Advice which I gave above, to read over and retain what has been ſaid about the bony part of the Organ of Hearing in the Deſcription of the Skeleton from Nº 260 to 267. and from Nº 392 to 444. It would be too long to repeat all theſe particulars in this place, but it is abſolutely neceſſary to have a compleat Idea of all the bony Parts, if we would underſtand the Deſcription of the other parts of the Ear, to which I am now to proceed.

385. These Parts are chiefly the Membrana Tympani, the Perioſteum of the Barrel, Oſſicula Auditus, Labyrinth, and of all its Cavities, the Membrana Maſtoidæa Interna, the Muſcles of the Oſſicula, the parts which compleat the formation of the *Euſtachian* Tube, the Arteries, Veins and Nerves. I find my ſelf however, under a neceſſity of beginning by the Tuba *Euſtachiana* for two Reaſons: Firſt, becauſe the bony parts of that Tube are but of very ſmall uſe for the Knowledge of its whole Structure and Compoſition; and Secondly, becauſe we are obliged to mention it in deſcribing the Muſcles.

386. I ſpoke of the *Euſtachian* Tube in the Deſcription of the Skeleton, by the name of Ductus Auris Palatinus; and I took notice that in *France* it goes generally by the name of the Aqueduct, which, however, mſt not be confounded with the Aqueductus *Falloppii.* In Nº 402 of Sect. I. I obſerved, that it is a Canal or Duct which goes from the Tympanum to the poſterior Openings of the Nares, or Naſal Foſſæ, and toward the Arch of the Palate; that it is dug in the Apophyſis Petroſa, along the

carotid Canal, and that it is lengthened out by the Spinal Apophyſis of the Os Sphenoidale.

387. In its natural ſtate, this Duct reaches from the Cavity of the Barrel, to the Root or ſuperior part of the internal Ala of the Apophyſis Pterygoides; and through this whole courſe it is made up of two Portions, one intirely Bony, and the other partly Bony, partly Cartilaginous, and partly Membranous. That Beginners may not here be miſled, it is very neceſſary to remember the Advice which I gave in the Deſcription of the Skeleton N° 186, &c. that in examining the lower parts of the Baſis Cranii, the Skull ought to be raiſed up, and viewed from below upwards, &c.

388. The bony Portion lies through its whole length immediately above the Fiſſure of the Glenoide or Articular Cavity of the Os Temporis, and terminates at the meeting of the Spinal Apophyſis of the Os Sphenoidale, with the Apophyſis Petroſa of the Os Temporis, that is, between that Spinal Apophyſis, and the inferior Orifice of the carotid Canal.

389. The other or mixed Portion reaches in the ſame Direction from this place, or the internal Ala of the Apophyſis Pterygoides, or to the poſterior and outer Edge of the Nares. But to form a more exact Idea of it, it will be proper to conſider it as divided into four Parts, two Superior and two Inferior.

390. The two upper Parts, or Quarters, are bony, and of theſe, the innermoſt is formed by the ſide of the Apophyſis Petroſa, the outermoſt, by the ſide of the Apophyſis Spinalis of the Os Sphenoides, ſo that the upper half of this Portion of the Tube is bony. Of the two inferior Parts, the internal is Cartilaginous, and the external Membranous, ſo that the lower half of this Portion of the Tube is partly Cartilaginous next the Os Sphenoidale, and partly Membranous next the Apophyſis Petroſa.

391. The *Euſtachian* Tube thus formed, is very narrow in the bony part next the Ear. The other Portion grows gradually wider, eſpecially near the poſterior Nares, where the inner Cartilaginous Side terminates by a prominent Edge, and the outer Side joins that of the neighbouring Noſtril. The Cavity of the Tube is lined by a Membrane like that of the internal Nares, of which it appears to be a Continuation; and on the prominent Edge, this Membrane is conſiderably increaſed in thickneſs, repreſenting a kind of half Pad.

392. The Situation of the two Tubes is oblique, their poſterior Extremities at the Ears being at a greater diſtance than the anterior at the Nares, and the convex ſides of the prominent Edges are turned toward each other. The Openings of the Tubes are oval at this place, as is likewiſe their whole Cavity, eſpecially that of the mixed Portion.

393. The Membrana Tympani is a thin, tranſparent, flattiſh Pellicle, the Edge of which is round, and ſtrongly fixed in the Orbicular Groove which divides the bony Meatus of the external Ear from the Tympanum, or Barrel. This Membrane is very much ſtretched or very tenſe, and yet not perfectly flat; for on the ſide next the Meatus Externus it has a ſmall Hol-

lowneſs which is pointed in the middle, and on the ſide next the Tympanum it is gently convex, and alſo pointed in the middle.

394. This Membrane is ſituated obliquely, the upper part of its Circumference being turned outward, and the lower part inward, ſuitably to the Direction of the bony Groove already mentioned. It is made up of ſeveral very fine Laminæ, cloſely united together. The external Lamina is in ſome meaſure a Production of the Skin and Cuticula of the external Meatus: for they may be pulled at the ſame time like the Finger of a Glove. The internal Lamina is a Continuation of the Perioſteum of the Tympanum, and when the Membrane, has been firſt macerated in Water, each of theſe Laminæ may be ſubdivided into ſeveral others, which I have ſometimes made to amount in all, to ſix. In very young Children this Membrane is covered on the outſide by a thick mucilaginous Web.

395. The Depreſſion in the middle of the Membrana Tympani is cauſed by the Adheſion of the little Bone called Malleus, the Handle of which is cloſely joined to the inſide of the Membrane from the upper part of the Circumference all the way to the Center to which the end of the Handle is fixed. This Handle ſeems to lie in a very fine membranous Duplicature, by means of which it is tied to the Membrana Tympani, and which ſerves it for a Perioſteum.

396. The Perioſteum of the Tympanum or Barrel of the Ear produces that of the ſmall Bones, and it may be made viſible by means of Anatomical Injections, which diſcover capillary Veſſels very diſtinctly ramified on the Surface of the Oſſicula, as has been ſhewn in my Private Courſes. It is likewiſe continued over the two Feneſtræ, and enters the *Euſtachian* Tube, where it is loſt in the inner Membrane of that Duct.

397. The Cellulæ Maſtoidæi are very irregular Cavities in the Subſtance of the Maſtoide Apophyſis, which communicate with each other, and have a common Opening towards the inſide, and a little above the poſterior Edge of the Orbicular Groove. Theſe Cells are lined by a fine Membrane, which is partly a Continuation of the Perioſteum of the Tympanum, and partly ſeems to be of a Glandular Structure like a kind of the Membrana Pituitaria. The Maſtoide Opening is oppoſite to the ſmall Opening of the *Euſtachian* Tube, but a little higher.

398. The Ligaments of the Oſſicula come next in order, to underſtand which, I ſuppoſe the Reader acquainted with what I ſaid concerning theſe ſmall Bones in the Deſcription of the Skeleton N° 407, &c. The Incus is tied by a ſtrong ſhort Ligament fixed in the Point of the ſhort Leg, to the Edge of the Maſtoide Opening. Between the Incus and Malleus we find a ſmall thin Cartilage. The Malleus is connected through the whole length of its Handle to the inſide of the Membrana Tympani, in the manner already ſaid. I need only add here, that by help of a Microſcope we diſcover round the Point of the Handle, in the Subſtance of the Membrane, a ſmall Orbicular Plane of a whitiſh Colour, a little inclined to Red.

399.

399. The Malleus has three Muſcles, one external, one anterior, and one internal; and the Stapes has one Muſcle. The external or ſuperior Muſcle of the Malleus, attributed to *Caſſerius*, and mentioned by *Fabricius ab Aquapendente*, is a thin Faſciculus of fleſhy Fibres lying along the upper part of the bony Meatus Auditorius, between the Perioſteum and the other Integuments. The outer part of it is pretty broad, and it contracts by degrees as it advances towards the upper Part or Break of the Orbicular Groove of the Tympanum, into which it enters by a ſmall Tendon, above the Membrana Tympani, and is inſerted in the Neck of the Malleus, near the ſmall Eminence or ſhort Apophyſis of the Handle. This Muſcle is ſometimes ſo pale as hardly to be diſtinguiſhed.

400. The anterior Muſcle of the Malleus, called by *M. Duvernay* the External, is fleſhy, long and thin. It runs along the outſide of the *Euſtachian* Tube, to which it adheres very cloſely thro' its whole length. Its anterior Extremity is fixed in that ſide of the Tube juſt before the Sphenoidal Spine; and the poſterior Extremity ends in a long thin Tendon, which runs in the Articular or Glenoide Fiſſure of the Os Temporis, through a ſmall oblique Notch in which Fiſſure, it enters the Tympanum, and is inſerted in the long thin Apophyſis of the Malleus. It is partly accompanied by a Nerve, which forms what is called the Chorda Tympani, as we ſhall ſee hereafter.

401. The internal Muſcle of the Malleus is very fleſhy and diſtinct. It lies along the inſide of the *Euſtachian* Tube, partly on the Cartilaginous, and partly on the Bony Portion, being fixed by one Extremity in the Apophyſis Petroſa. Afterwards it runs along the Cavity of the bony half Canal of the Tympanum, within which Cavity it is inveſted by a Portion of a Membranous or Ligamentary Vagina, which being fixed to the Edges of the half Canal, forms an intire Tube therewith, and this Vagina muſt be cut open before we can ſee the Muſcle.

402. At the Extremity of this bony half Canal, where we obſerve the Cavity ſhaped like the Mouth of a Spoon, mentioned in the Deſcription of the Skeleton Nº 399. this Muſcle ends in a Tendon, which is bent round the tranſverſe bony or ligamentary Ridge in the laſt named Cavity, as over a Pulley, and is inſerted in the Neck of the Malleus above the ſmall Apophyſis, advancing likewiſe as far as the Handle. The Extremities of the anterior and internal Muſcles ſometimes meet, and there they cover the mixed Portion of the *Euſtachian* Tube.

403. The Muſcle of the Stapes is ſhort and thick, and lies concealed within the ſmall bony Pyramid at the bottom of the Tympanum. The Cavity which it fills, touches very nearly the bony Canal of the Portio Dura of the Auditory Nerve; and it terminates in a ſmall Tendon which goes out of the Cavity through the ſmall Hole in the Apex of the Pyramid. As it goes through the Hole it turns forward, and is inſerted in the Neck of the Stapes on the ſide of the longeſt and moſt crooked Leg of that Bone.

404. The three parts of the Labyrinth, that is, the Veſtibulum, ſemicircular Canals, and Cochlea, are lined by a fine Perioſteum, which is continued over all the ſides of their Cavities, and ſhuts the two Feneſtræ of the Tympanum.

405. In all the Subjects which I ever examined, I have found the ſemicircular Canals ſimply lined by a Perioſteum adhering to their inner Surfaces, without any particular membranous Bands. The two half Canals of the Cochlea are lined in this manner: The Perioſteum of the two ſides of the bony Spiral Lamina, advances beyond the Edge of that Lamina, and forms a membranous Duplicature, which extending to the oppoſite ſide compleats the Spiral Septum.

406. This Septum ſeparates the two half Canals from the Baſis to the Apex, but there it leaves a ſmall Opening, by which the ſmall Extremities of the half Canals communicate with each other. The large Extremity of the external half Canal ends by an oblique Turn, in the Feneſtra Rotunda, which is ſhut by a Continuation of the Perioſteum of that Canal. The large Extremity of the other half Canal opens into the Veſtibulum; and theſe two Extremities are intirely ſeparated by a Continuance of the Perioſteum.

407. All the Perioſteum of the internal Ear, eſpecially that of the Oſſicula and Tympanum, is in Children no more than a Mucilage; and in them likewiſe the Membrana Tympani is thick, opaque, and covered with a whitiſh ſlimy Matter.

408. Through the whole extent of the Perioſteum of the internal Ear, eſpecially on that of the Oſſicula, ſemicircular Canals, and half Canals of the Cochlea, we diſcover a vaſt number of Blood-Veſſels, not only by Anatomical Injections, but in Inflammations, and even without the help of a Microſcope; for I have often ſhewn them to the naked Eye in the ſemicircular Canals and half Canals of the Cochlea. The Arteries come partly from the internal Carotid, and partly from the Arteria Baſilaris, which is a Continuation of the Vertebralis, the ſmall capillary Ramifications of which may be obſerved to accompany the Auditory Nerve through the internal Foramen Auditorium.

409. The Portio Mollis of the Auditory Nerve ends by its Trunk, at the great Foſſula of the internal Auditory Hole, from whence the Filaments paſs through ſeveral ſmall Holes in the Baſis of the Cochlea, partly to the Perioſteum of the ſemicircular Canals, and partly to the internal Perioſteum of the half Canals of the Cochlea.

410. The Portio Dura, which I name Nervus Sympatheticus Minor, runs firſt of all into the ſmall Foſſula of the Foramen Auditorium Internum, then paſſes through the whole bony Duct, called Aqueductus *Fallopii*, and comes out again through the Stylo-Maſtoide Hole of the Os Temporis. In this courſe it communicates with the Dura Mater on the upper or anterior ſide of the Apophyſis Petroſa, at the place where the bony Duct is interrupted, as was mentioned in the Deſcription of the Skeleton Nº 264, 443.

411. Having reached behind the ſmall Pyramid in the bottom of the Tympanum, this Nerve ſends a ſmall Filament to the Muſcle of the Stapes; and a little before it goes out by the Stylo-Maſtoide Hole, it gives off another more conſiderable Filament, which enters the Tympanum from behind forward, paſſes between the long Leg of the Incus and Handle of the Malleus, and afterwards runs croſs the whole breadth of the Tympanum a little obliquely, and goes out at the ſame place at which the Tendon of the anterior Muſcle of the Malleus enters.

412. This ſmall Nerve is generally called Chorda Tympani, becauſe in its paſſage through the Tympanum it has been compared to the Cord of a Drum. Having left the Cavity of the internal Ear, it advances toward one ſide of the Baſis of the Tongue, where having joined the ſmall Nervus Lingualis, it is conſidered as a kind of Recurrent; but the remaining part of its courſe muſt be referred to the Deſcription of the Tongue.

413. The Portio Dura of the Auditory Nerve having paſſed through the Foramen Stylo-Maſtoidæum, is diſtributed in the manner already mentioned in the Deſcription of the Nerves; and we ought very carefully to obſerve its different communications with the Branches and Rami of the Nerves of the fifth Pair, with the Sympatheticus Medius or eighth Pair, with the ſecond Pair of cervical Nerves, and with the Nervi Sub-Occipitales, or tenth Pair of the Medulla Oblongata, &c.

414. The Ear is the Organ of which we can moſt diſtinctly unfold the Structure, and demonſtrate the greateſt number of Parts, that is, of ſmall Machines of which it is made up. We know likewiſe in general that it is the Organ of Hearing; but when we endeavour to diſcover the Uſes of each of theſe Parts, that is, how each contributes to the great deſign of the whole, after having thoroughly examined them, we muſt be obliged to own that the greateſt part of what the moſt able Philoſophers have ſaid upon this Subject, is without any real foundation.

415. It is certain that the Cavity of the external Ear collects Sounds or Noiſe, and concenters it towards the bottom of the Concha, all the way to the external Meatus Auditorius. This we learn from Experience, by enlarging this Cavity with the Hand. It may likewiſe be affirmed with certainty, that in proportion as the Membrana Tympani is more or leſs ſtretched, Sounds become more or leſs ſenſible. This Experience teaches us; for when this Membrane is wetted by any Liquor, our Hearing is imperfect, but is reſtored again when the Membrane is dry. By the Muſcles of the Oſſicula, we can demonſtrate that this Membrane is capable of being ſtretched and relaxed, as occaſion requires; but the proſecution of this curious Subject muſt be referred to another Treatiſe.

## ART. V.

### *The Mouth.*

*Introduction.* 416. THE word Mouth may have two ſignifications: for firſt, it means the tranſverſe Slit between the Noſe and Chin, formed by the Lips, and ſecondly, it expreſſes the internal Cavity, of which this tranſverſe Slit is the external Opening. For this reaſon the Mouth may be diſtinguiſhed into external and internal, and the Parts of which it conſiſts may likewiſe come under the ſame two general Heads. The bony Parts are the Oſſa Maxillaria, Oſſa Palati, Maxilla Inferior, and the Teeth: To theſe we may add the Os Hyoides, and the upper Vertebræ of the Neck.

417. THE external Parts of the Mouth are the two Lips, one upper, the other under, the Borders or red parts of the Lips, the Corners or Commiſſures of the Lips, the Foſſula of the upper Lip, the Baſis of the under Lip, the Chin, the Baſis of the Chin, the Skin, Beard, and even the Cheeks, as being the lateral parts of the Mouth in general, and of the Lips in particular.

418. THE internal parts of the Mouth are the Gums, Palate, Septum Palati, Uvula, Amygdalæ, the Tongue, the Membrane which lines the whole Cavity of the Mouth, the Salival Ducts and Glands, and the bottom of the Mouth. We might likewiſe reckon among the internal parts of the Mouth, all the Muſcles that have any relation to it, as thoſe of the Lips, of the Tongue, of the Uvula, of the Septum Palati, &c. and to theſe might be added the Muſcles of the Lower Jaw, and of the Os Hyoides, which have been already deſcribed.

419. IN the Compendious View of the Parts of the Human Body, I made a general Enumeration of all thoſe that belong to the Neck, of which there is a very conſiderable number, but the greateſt part of them has been already deſcribed among the Bones, Muſcles, Arteries, Veins and Nerves; and of thoſe that remain, very few belong to the Deſcription of the Thorax.

420. THE Parts of the Neck ſtill undeſcribed are only the Larynx, Pharynx, Glandulæ Thyroideæ, and the Muſculus Cutaneus, which really belongs to the Head; and therefore inſtead of making a particular Section for ſo ſmall a number of Parts, I choſe to bring them in, under the Deſcription of the Head, eſpecially ſince the Larynx and Pharynx have ſo near a relation to the internal parts of the Mouth, that I find my ſelf under a neceſſity of deſcribing them, before I proceed to the Mouth in particular.

### §. 1. *The Larynx.*

421. THE Larynx forms the Protuberance in the upper and anterior part of the Neck, called commonly Pomum Adami. Anatomiſts term it the Head of the Trachea Arteria, which I explained particularly in the Deſcription of the Thorax Nº 127, &c. and it is larger and more prominent in Men than in Women.

422. IT is chiefly made up of five Cartilages, the names of which are theſe: Cartilago Thyroides, which is the anterior and largeſt; Cricoides, the inferior, and Baſis of the reſt; two Arytenoides, the poſterior and ſmalleſt; and the Epiglottis, which is above all the reſt. Theſe Cartilages are connected together by Ligaments, and they have likewiſe Muſcles, Glands, Membranes, &c. belonging to them.

*Cartilago Thyroides.* 423. THE Cartilago Thyroidæa is large and broad, and folded in ſuch a manner as to have a longitudinal Convexity on the foreſide, and two lateral Portions which may be termed Alæ. The upper part of its anterior middle Portion is formed into an angular Notch; the upper Edge of each Ala makes an Arch, and together with the middle Notch, theſe two Edges reſemble the upper part of an Ace of Hearts in playing Cards.

424. THE lower Edge of each Ala is more even, and the poſterior Edges of both are very ſmooth, being lengthened out both above and below by Apophyſes, which I name the Cornua of the Thyroide Cartilage. The ſuperior Apophyſes are longer than the inferior, and the Extremities of all the four are rounded like ſmall Heads, which in the inferior Apophyſes, have a ſhining Surface on the inſide, reſembling an articular Eminence.

425. ON the outſide of each Ala near the Edge, is a prominent oblique Line which runs from behind forward. The upper Extremity of this Line is near the ſuperior Apophyſis or Cornu, and both that and the lower Extremity end in a ſmall Tuberoſity, the loweſt being often the moſt conſiderable. Theſe Tuberoſities ſerve for the Inſertion of Muſcles and Ligaments. The inſide of the Alæ and the convex ſide of the anterior Portion are very uniform; and this Cartilage oſſifies gradually in old Age.

*Cartilago Cricoides.* 426. THE Cricoide Cartilage reſembles a kind of thick, irregular Ring, very broad on one ſide and narrow on the other; or it may be compared to a ſmall Portion of a thick Tube, cut horizontally at one end, and very obliquely at the other. I diſtinguiſh it into a Baſis and Top, into an anterior, poſterior, and two lateral ſides. The Baſis is almoſt horizontal, when we ſtand, and to this the Aſpera Arteria is connected, ſo that the Cricoides may be looked upon as the upper Extremity of the Trachea.

427. THE poſterior Portion of the Cricoides is larger than the reſt, and its poſterior or convex ſide is divided by a longitudinal Eminence, or prominent Line into two diſtinct Surfaces, for the Inſertion of Muſcles. The Top is gently ſloped above this prominent Line, and terminates on each ſide by a kind of obtuſe Angle, formed between it and the oblique Edge

of each lateral Portion of this Cartilage. At the upper part of each of theſe Angles, there is a very ſmooth articular Surface, gently convex.

428. The whole poſterior ſide is diſtinguiſhed into two lateral Portions by two prominent Lines, each of which runs down almoſt in a ſtreight Direction from the articular Surface at the Top, a little below the middle of this ſide, where it terminates in another articular Line a little concave; and near theſe four articular Surfaces there are ſmall Tubercles. The two ſuperior Surfaces are for the Articulation of the Cartilagines Arytenoidææ, as we ſhall ſee preſently; and the two inferior, for the Articulation of the inferior Cornua or Appendices of the Cartilago Thyroides.

*Cartilagines Arytenoides.*

429. The Cartilagines Arytenoidææ are two ſmall, equal, ſimilar Cartilages, which joined together, reſemble the Spout of an Ewer, and they are ſituated on the Top of the Cricoides. In each, we may conſider the Baſis, Cornu, two ſides, one poſterior and concave, the other anterior and convex, and two Edges, one internal, the other external, which is very oblique. The Baſes are broad and thick, and have each a concave articular Surface, by which they are joined to the Cricoides.

430. The Cornua are bent backward, and a little toward each other. In ſome Subjects they are very looſe, appearing like true Appendices, and eaſily ſeparable from the reſt, as I demonſtrated in my private Courſes about eight Years ago. Between their inner Edges they form a kind of Fiſſure, and their outer oblique Edges terminate each by a thick prominent Angle.

*Epiglottis.*

431. The Epiglottis is an Elaſtic Cartilage, nearly of the Figure of a Purſlane Leaf, narrow and thick at the lower part, thin and ſlightly rounded at the upper part, gently convex on the foreſide, and concave on the backſide. It is ſituated above the anterior or convex Portion of the Cartilago Thyroides; and its lower Extremity is tied by a ſhort, pretty broad and very ſtrong Ligament to the middle Notch in the upper Edge of that Cartilage. It is perforated by a great number of Holes, ſomething like thoſe in the Leaves of the Hypericum or St. John's-Wort, which are hid by the Membranes that cover its two ſides.

*Ligaments of the Larynx.*

432. The Cartilago Thyroides is connected to the Cricoides by ſeveral ſhort ſtrong Ligaments, round the Articulations of the two inferior Cornua with the lateral articular Surfaces of the Cricoides. The Apices of the ſuperior Cornua are fixed to the poſterior Extremities of the great Cornua of the Os Hyoides, by ſlender round Ligaments, about a Quarter of an Inch in length.

433. In the middle of each of theſe Ligaments, we often meet with a ſmall Cartilage of an oval Figure, and much thicker than the Ligaments. The Thyroides is likewiſe connected to the Os Hyoides by a ſhort broad ſtrong Ligament, one end of which is inſerted in the ſuperior Notch of the Cartilage, and the other in the lower Edge of the Baſis of the Bone. It has alſo two Ligaments at the middle of the concave ſide which belong to the Arytenoidææ.

434. The Cricoides is tied to the lower part of the Thyroides by a ſtrong Ligament; and by the Ligaments already mentioned, to the inferior Cornua of that Cartilage. Its Baſis is fixed to the firſt Cartilaginous Ring of the Trachea Arteria, by a Ligament exactly like thoſe by which the other Rings are connected together; and the membranous or poſterior Portion of the Trachea is likewiſe fixed to the poſterior part of the Baſis of the Cricoides.

435. The Cartilagines Arytenoidææ are connected to the Cricoides by Ligaments, which ſurround their Articulations with the Top of that Cartilage. Anteriourly the Baſis of each Arytenoides is fixed to one end of a Ligamentary Cord, which by its other end is inſerted about the middle of the concave ſide of the anterior Portion of the Thyroides. At their Inſertions in the Thyroides, theſe two Ligaments touch each other, but a ſmall Space is left between them, where they are fixed in the two Arytenoides; and they ſeem likewiſe to have a ſmall Adheſion to the Top of the Cricoides. This is what is called the Glottis. *Glottis.*

436. Under theſe two Ligamentary Cords there are two others which run likewiſe from behind, forward. The Interſtice between the ſuperior and inferior Cords on each ſide form a tranſverſe Fiſſure, which is the Opening of a ſmall membranous Bag, the bottom of which is turned outward, that is, toward the Ala of the Thyroides. Theſe two Sacculi are the Ventricles mentioned by the Ancients, and reſtored by *M. Morgagni*, who has given an excellent Deſcription of them. They are chiefly formed by a Continuation of the internal Membrane of the Larynx, and the inner Surface of their bottom appears ſometimes to be Glandulous.

437. On the anterior Surface of the Arytenoide Cartilages, there is a ſmall Depreſſion between the Baſis and the convex upper part. This Depreſſion is filled by a Glandulous Body, which not only covers the anterior Surface of each Arytenoides, but is likewiſe extended forward from the Baſis over the poſterior Extremity of the neighbouring Ligamentary Cord. They are larger and more ſenſible in ſome Subjects than in others; and they are covered by the Membrane which lines the neighbouring Parts. Theſe Glands were diſcovered by *M. Morgagni*.

438. I have already deſcribed the Ligaments which connect the Epiglottis to the Notch of the Thyroides, and to the Baſis of the Os Hyoides. Theſe two Ligaments, and a third which ties the Baſis of the Os Hyoides to the Notch of the Thyroides, form a triangular Space filled with a cellular or fatty Subſtance, and with ſmall Glands.

439. The Epiglottis has likewiſe two lateral Ligaments, by which it is connected to the Arytenoides, all the way to their Points or Cornua. It has alſo a membranous Ligament, which running along the middle of its anterior or concave ſide, ties it to the Root or Baſis of the Tongue. This Ligament is only a Duplicature of the Membrane which covers the Epiglottis, continued to the neighbouring Parts. Laſtly, there are two lateral membranous Ligaments belonging to it, fixed near the Glandulous Bodies called Amygdalæ.

440. The Epiglottis is not only perforated by the regular Holes already mentioned, but has likewiſe a great number of ſmall irregular Sciſſures and Breaks, which are ſo many different Lacunæ ſituated between its two Membranes, and filled with ſmall Glands, the Excretory Orifices of which are chiefly on the backſide of this Cartilage.

*Muſcles of the Larynx.*

441. The Larynx gives Inſertion to a great number of Muſcles, which may be divided into common, proper and collateral. The common Muſcles, according to the general Acceptation of that Term, are all thoſe that move the whole Body of the Larynx, one Extremity of them being inſerted in other Parts; and theſe are reckoned to be four in number, two for each ſide, viz.

Sterno-Thyroidæi,
Thyro-Hyoidæi, or Hyo-Thyroidæi.

442. The proper Muſcles are thoſe inſerted wholly in the Larynx, and which move the Cartilages ſeparately. Theſe have been divided in various manners, but may be all reduced to the following Pairs.

Crico-Thyro-Hyoidæi.
Crico-Arytenoidæi Laterales.
Crico-Arytenoidæi Poſteriores.
Thyro-Arytenoidæi.
Arytenoidæi.
Thyro-Epiglottici.
Aryteno-Epiglottici.
Hyo-Epiglottici.

443. By the collateral Muſcles, I underſtand thoſe which are inſerted by one Portion in the Larynx, without appearing to contribute any thing to the Motions of it. Of this kind are the Thyro-Pharyngæi, Crico-Pharyngæi, &c. of which hereafter.

444. The Larynx may likewiſe be moved by Muſcles, which are not immediately inſerted in it, but altogether in other Parts. Such are the Mylo-Hyoidæi, Genio-Hyoidæi, Stylo-Hyoidæi, Omo-Hyoidæi, Sterno-Hyoidæi, and eſpecially the Digaſtrici of the lower Jaw, by reaſon of their particular Adheſion to the Os-Hyoides. It is likewiſe probable that thoſe Muſcles of the Pharynx which are inſerted in the Baſis Cranii, may in certain circumſtances, move the Larynx in ſome ſmall degree.

*Sterno-Thyroidæi.*

445. The Sterno-Thyroidæi are two long, flat, narrow, thin Muſcles, like Ribbons, broader above than below, and ſituated along that part of the Neck which lies between the Thyroide Cartilage and the Sternum. They are covered by the Sterno-Hyoidæi, and they cover the Thyroide Glands, paſſing immediately before them.

446. Each Muſcle is fixed by its lower Extremity, partly in the ſuperior Portion of the inner or backſide of the Sternum, partly in the Liga-

ment and neighbouring Portion of the Clavicula, and partly in the Cartilaginous Portion of the firſt Rib. Sometimes it runs a great way down on the firſt Bone of the Sternum, and croſſes the Muſcle on the other ſide. From thence it runs up on the Aſpera Arteria, cloſe by its Fellow, paſſes before the Thyroide Glands, over the Cricoide Cartilage, and is inſerted by its upper Extremity, in the lower part of the lateral ſide of the Thyroide Cartilage, and partly along that whole ſide. I have found this Muſcle double, one diſtinct Portion of it being inſerted in the Baſis, and the other laterally.

447. The Thyro-Hyoidæi, or Hyo-Thyroidæi are two flat, thin Muſcles, lying cloſe by each other, between and above the former. Each of them is inſerted by its upper Extremity, partly in the Baſis, and partly in the neighbouring part of the great Cornu of the Os Hyoides; and by its lower Extremity, in the lower part of the lateral ſide of the Thyroide Cartilage, immediately above the ſuperior Extremity of the Sterno-Thyroidæus; and both this ſuperior Extremity of the laſt named Muſcle, and the lower Extremity of the Thyro-Hyoidæus are, at their place of Union, confounded a little with the Thyro-Pharyngæus Inferior, of which hereafter. *Thyro-Hyoidæi.*

448. The Crico-Thyroidæi are two ſmall Muſcles, ſituated obliquely at the lower part of the Thyroide Cartilage. They are inſerted by their lower Extremities in the anterior Portion of the Cricoide Cartilage, near each other, and by their ſuperior Extremities, laterally in the lower Edge of the Thyroide Cartilage at a diſtance from each other. By this oblique Situation, they repreſent a Roman V. *Crico-Thyroidæi.*

449. Each of theſe ſmall Muſcles is in a manner double, its upper Extremity inſerted in the Thyroide Cartilage, being in ſome Subjects very broad and divided into two Portions, one anterior, the other more lateral and more oblique. They may likewiſe be eaſily ſeparated into two diſtinct Muſcles, whereof one may be called Crico-Thyroidæus Anterior ſive Internus; the other Lateralis ſive Externus.

450. The two Muſculi Crico-Arytenoidæi Poſteriores are ſituated poſteriourly at the large or back Portion of the Cricoides, filling almoſt the two longitudinal Surfaces of that Portion, and diſtinguiſhed by the prominent Line between theſe two Surfaces, already mentioned. Each of them runs up obliquely, and is inſerted by its upper Extremity, in the poſterior part of the Baſis of the Arytenoide Cartilage of the ſame ſide, near the Angle of that Baſis. *Cryco-Arytenoidæi Poſteriores.*

451. The two Crico-Arytenoidæi Laterales are ſmall, and ſituated more laterally than the former. Each Muſcle is fixed by one end to the ſide of the broad part of the Cricoides, and by the other, to the lower part of the ſide of the neighbouring Arytenoides. *Crico-Arytenoidæi Laterales.*

452. The two Thyro-Arytenoidæi are very broad, each Muſcle being ſituated laterally between the Thyroides and Cricoides. It is fixed by a broad Inſertion in the inſide of the Ala of the Thyroide Cartilage; and the Fibres contracting from thence, run from before backward, and from *Thyro-Arytenoidæi.*

below upward, towards the neighbouring Arytenoide Cartilage, in which they are inſerted, from the Glottis to the Angle of the Baſis. In ſome Subjects, theſe Muſcles cover almoſt both ſides of the Glottis.

*Arytenoidæi.* 453. The Arytenoidæi are ſmall Muſcles lying on the poſterior concave ſides of the Arytenoide Cartilages. Dr *James Douglas* in the firſt Edition of his Treatiſe of the Muſcles, divided them into two kinds, one of which he called Arytenoidæi Majores, the other Arytenoidæi Minores; and it muſt be owned that there is ſome variety in different Subjects. I ſhall here confine my ſelf to what I have moſt frequently and moſt diſtinctly obſerved, and that is, that there are two crucial Arytenoidæi and one tranſverſe.

454. The crucial Muſcles run each obliquely from the Baſis of one Arytenoide Cartilage, to the middle and upper part of the other, the left Muſcle covering the right, as is obſerved by *M. Morgagni* in his firſt Adverſaria.

455. I look upon theſe Muſcles as Superior Crico-Arytenoidæi, becauſe I have always found them partly inſerted in the upper neighbouring Portion of the Cricoides. The Arytenoidæus Tranſverſalis is inſerted more or leſs directly by both Extremities, in the two Arytenoide Cartilages; and this I look upon as the true Muſculus Arytenoidæus.

*Thyro-Epiglottici.* 456. The two Thyro-Epiglottici croſs the Thyro-Arytenoidæi, being inſerted in the inner lateral part of the Thyroides, and laterally in the Epiglottis.

*Aryteno-Epiglottici.* 457. The Aryteno-Epiglottici are ſmall fleſhy Faſciculi, each of which is fixed by one Extremity in the Head of one of the Arytenoide Cartilages, and by the other in the neareſt Edge of the Epiglottis.

*Hyo-Epiglottici.* 458. I never had an opportunity of examining the Hyo-Epiglottici in very muſcular Subjects, and therefore I am not ſure that the Fibres which go from the convex ſide of the Baſis of the Os Hyoides, to the convex ſide of the Epiglottis, are really fleſhy.

*Uſes.* 459. The Larynx ſerves particularly to admit and let out the Matter of Reſpiration; and the Solidity of the Pieces of which it is compoſed hinders not only external Objects, but alſo any hard thing which we ſwallow, from diſordering this Paſſage. The Glottis being a narrow Slit, modifies the Air which we breathe, and as it is very eaſily dilated and contracted, it forms the different Tones of the Voice, chiefly by means of the different Muſcles inſerted in the Cartilagines Arytenoidææ, to which the other Muſcles of the Larynx, both Proper and Common, are Aſſiſtants.

460. The whole Larynx is likewiſe of uſe in Deglutition, as has been already obſerved, by means of its Connexion with the Os Hyoides, to which the Digaſtric Muſcles of the Lower Jaw adhere; which Muſcles raiſe the Larynx together with the Os Hyoides every time we ſwallow. I have already ſaid ſomething on this Subject in the Deſcription of the Muſcles N° 1130, 1131, 1132. and ſhall further explain it after the Deſcription of the Pharynx and Tongue.

461. The Facility of varying and changing the Tone of the Voice, depends on the Flexibility of the Cartilages of the Larynx, and decreaſes in proportion as we advance in Age; becauſe theſe Cartilages gradually harden and oſſify, though not equally ſoon in all Perſons; and this change happens not only to the Cartilago Thyroides, but alſo to the Cricoides and Arytenoides.

462. The Muſculi Sterno-Thyroidæi ſerve in general to pull down the Thyroide Cartilage, and the whole Larynx along with it. They may likewiſe aſſiſt the Sterno-Hyoidæi in its Actions explained Sect. 3. N° 1149. and compreſs the Thyroide Gland, of which hereafter. The Thyro-Hyoidæi may, as occaſion requires, either draw up the Larynx toward the Os Hyoides, or draw that Bone downward toward the Cartilago Thyroides.

463. It is difficult to determine the uſe of the Crico-Thyroidæi from their Situation. They may either pull the Cricoides obliquely backward, or the Thyroides obliquely forward; and by this Action the inferior Cornua of the Thyroides, and ſmall articular Surfaces of the Cricoides, muſt ſlide upon each other.

464. Both the lateral and poſterior Crico-Arytenoidæi, may ſeparate the Arytenoide Cartilages, and thereby open or dilate the Glottis, but they do not both perform this Action in the ſame manner. The lateral Muſcles ſeparate theſe Cartilages obliquely forward, and at the ſame time looſen or relax the ſides of the Glottis; but the poſterior Muſcles ſeparate them obliquely backward, and at the ſame time ſtretch or extend the ſides of the Glottis; and when both Muſcles act equally, they ſeparate the Cartilages directly.

465. The Thyro-Arytenoidæi acting together, draw both the Arytenoide Cartilages forward, and conſequently looſen the Glottis, and render it capable of the ſmalleſt Quaverings of the Voice. They may likewiſe probably compreſs the lateral Sinuſes or Ventricles of the Larynx, and alſo the Arytenoide Glands.

466. The Arytenoidæi bring the Arytenoide Cartilages cloſe together, and preſs them againſt each other; and when the Cartilages are in this Situation, they may at the ſame time be inclined either forward by the Thyro-Arytenoidæi, or backward by the Crico-Arytenoidæi Poſteriores. By this means the Glottis, when ſhut, may be either relaxed or tenſe, and in this laſt caſe, it is intirely ſhut, as when we hold in our Breath in ſtraining; but of this more in another place.

467. The general uſe of the Epiglottis is to cover the Glottis like a Penthouſe, and thereby hinder any thing from falling into it when we eat or drink; and for this purpoſe it is depreſſed in the manner that ſhall be ſhewn hereafter. It ſerves likewiſe to hinder the Air which we inſpire, from ruſhing directly upon the Glottis, but by ſplitting it, as it were, obliges it to enter by the ſides, or in an oblique courſe. The Muſcles of the Epiglottis do not appear to be abſolutely neceſſary for that Cartilage; for in Deglutition, it may be ſufficiently depreſſed by the Baſis

of the Tongue; and it may raiſe itſelf again by its own Elaſticity. The Thyro-Epiglottici and Aryteno-Epiglottici may ſerve to ſhut any lateral Openings that might remain when the Epiglottis is depreſſed by the Baſis of the Tongue; and the Hyo-Epiglottici may pull it a little forward in ſtrong Reſpirations, as in Sighing, Yawning, &c.

## §. 2 *The Pharynx.*

468. THE Pharynx is a muſcular and glandular Bag, the outer Surface of which is cloſely joined to the inner Surface of all that Space which is at the bottom of the Mouth, behind the poſterior Nares, Uvula, and Larynx, and which reaches from the great or anterior Apophyſis of the Os Occipitis all the way to the Œſophagus, which is the Continuation of the Pharynx. This Space is bounded poſteriourly by the Muſcles which cover the Bodies of the firſt Vertebræ of the Neck, and laterally by the ſuperior Portions of both the internal Jugular Veins, and of both the internal Carotid Arteries, by the Spinal Apophyſes of the Os Sphenoides, by the Extremities of the Apophyſes Petroſæ, by the Os Sphenoides, immediately above the internal Alæ of the Apophyſes Pterygoides, and by the neighbouring Portion of both Pterygoide Muſcles.

469. FROM theſe Limits and Adheſions of the Pharynx we may pretty nearly determine its Figure. It may be compared to the wide part of a covered Funnel of which the Œſophagus is the narrow Part or Tube; or it may be called the broad end of the Œſophagus, that and the Pharynx taken together, being compared to a Trumpet. The Pharynx may be divided into three Parts, one Superior, which is the Arch of the Pharynx, one Middle, which is the Body or great Cavity, and one Inferior, which is the Bottom, narrow Portion, or Sphincter. We are likewiſe to obſerve in it three Openings, that of the Arch, toward the Nares, that of the Body, toward the Mouth, and that of the Bottom toward the Œſophagus.

470. THE Arch is the broadeſt part of the Pharynx, and ends on each ſide in an Angle or Point, toward the Jugular Foſſulæ of the Baſis Cranii. Afterwards the great Cavity contracts a little toward the ſides, all its other Dimenſions continuing the ſame; and behind the Larynx it is again enlarged on each ſide, a very ſmall Space being left between it and the Cricoide Cartilage. The Extremity of the lower Portion is very narrow, and joins the Baſis of the Cartilage juſt named.

471. THE Pharynx is made up partly of ſeveral diſtinct fleſhy Portions, which are looked upon as ſo many different Muſcles ſo diſpoſed as to form a large Cavity, and partly of a Membrane which lines the inner Surface of this whole Cavity, and is a Continuation of that of the Nares and Palate.

472. THIS Membrane is wholly Glandular, and it is thicker on the ſuperior and middle Portions of the Pharynx, than on the Bottom or lower Portion. Immediately above the firſt Vertebra, it forms ſeveral Longitu-

dinal Rugæ very thick, deep and ſhort, and we generally find therein, a collection of Mucus in dead bodies. In the great Cavity there are no Rugæ, the Membrane adhering both there and in the upper part, very cloſely to the Muſcles. At the lower part where it is thinneſt, it covers likewiſe the poſterior part of the Larynx, and is very looſe, and formed into irregular Folds. It runs in a little on each ſide between the Edges of the Pharynx.

*Muſcles of the Pharynx.*

473. Though almoſt all the muſcular or fleſhy Portions of which the Pharynx is compoſed, concur in the formation of one continued Bag or Receptacle, they are nevertheleſs very diſtinguiſhable from each other, not only by their different Inſertions, from which they have been denominated, but alſo by the different Directions of their Fibres. The greateſt part of them may be looked upon as Digraſtic Muſcles, the middle Tendons of which lie backward in one longitudinal Line, which in ſome Subjects appears plainly like a Linea Alba.

474. These Muſcles may be reduced to three general Claſſes, with regard to their inſertions. The firſt Claſs is of thoſe which are inſerted in the Baſis Cranii, viz.

Cephalo-Pharyngæi.
Petro-Pharyngæi.
Spheno-Pharyngæi, ſive Spheno-Salpingo-Pharyngæi.
Pterygo-Pharyngæi.
Stylo-Pharyngæi.

The ſecond Claſs comprehends thoſe which are inſerted toward the Mouth, viz.

Peryſtaphilo-Pharyngæi.
Gloſſo-Pharyngæi.
Hypero-Pharyngæi.
Genio-Pharyngæi.

The third Claſs includes thoſe inſerted in the lateral parts of the Larynx, viz.

Syndeſmo-Pharyngæi.
Thyro-Pharyngæi.
Crico-Pharyngæi.
Œſophagæus.
Adeno-Pharyngæus.

475. The Cephalo-Pharyngæi are inſerted in the lower ſide of the Apophyſis Baſiliaris, or great Apophyſis of the Os Occipitis, about the middle of the poſterior part. From thence they ſeparate laterally, and

ſometimes join the Stilo-Pharyngæi. The Linea Alba of the Pharynx begins by the middle Adheſion of theſe Muſcles.

476. The Petro Pharyngæi are inſerted in the lower part of the Extremity of the Apophyſis Petroſa: the Spheno-Pharyngæi, partly in the Os Sphenoides, directly above the internal Ala of the Apophyſis Pterygoides, and partly in the neighbouring cartilaginous Portion of the *Euſtachian* Tube; and the Pterygo-Pharyngæi, in the Edge of the ſame Ala of the Apophyſis Pterygoides. Theſe three Muſcles on each ſide run obliquely backward, covering each other by ſome Fibres, and meet at the Linea Alba. Their uſe may be to draw the middle Portion or great Cavity of the Pharynx, upward.

477. The Stylo-Pharyngæi are inſerted interiourly by one Extremity in the Apophyſis, or Epiphyſis Styloides. From thence each Muſcle runs down obliquely along the lateral part of the Pharynx, covering and croſſing the other Muſcles. It extends gradually in breadth as it deſcends, and forms two principal Portions, one Superior which is narrow, and one Inferior which is broad. The narrow Portion is ſpread among the muſcular Fibres above the Thyroide Cartilage, and the broad Portion is inſerted in the ſide of that Cartilage; and thus the Stylo-Pharyngæus is partly a true Stylo-Thyroidæus. Theſe Muſcles may draw the Pharynx laterally upward, eſpecially by their Thyroide Portions; but the Uſe commonly aſſigned to them of dilating the Pharynx, ſeems conformable neither to their Situation, nor to their Direction.

478. The Periſtaphylo-Pharyngæi are two ſmall Muſcles inſerted between the Uvula and lower Extremity of the internal Ala of the Apophyſis Pterygoides, and run obliquely backward on the ſides of the Pharynx. It is difficult to find them in very lean or young Subjects, and they ſeem to be the ſame which *M. Santorini* calls Hypero-Pharyngæi, or Palato-Pharyngæi. The Gloſſo-Pharyngæi are Fibres which run along the lateral Edges of the Tongue, from which they are parted backward, and run down on the ſides of the Pharynx under the Stylo-Pharyngæi.

479. The Hyo-Pharyngæi in general are thoſe on each ſide which are inſerted in the Os Hyoides; and they may be reckoned three Pairs, the Baſio-Pharyngæi, Kerato-Pharyngæi Minores, and Kerato-Pharyngæi Majores; theſe Denominations being taken from their Inſertions in the Baſis, and in the ſmall and great Cornua of the Os Hyoides.

480. I have never been able to ſee diſtinctly the Mylo-Pharyngæi of Dr. *James Douglas*; all that I have hitherto found is a muſcular Portion really diſtinct from the Genio-Gloſſus, inſerted in the ſide of the Pharynx, and for that reaſon I call it Genio-Pharyngæus, as being joined to the Genio-Gloſſus all the way to the Chin.

481. The Syndeſmo-Pharyngæi of Dr. *Douglas* are Faſciculi of Muſcular Fibres very diſtinctly inſerted by one end along the Ligaments by which the ſuperior Cornua of the Cartilago Thyroides are connected to the Extremities of the great Cornua of the Os Hyoides. From thence they run backward and meet at the Linea Alba. To be able to ſee them diſtinct

from the other Muſcles, the Pharynx muſt be filled with Cotton to give it a proper Convexity, and to ſupport its Sides, which otherwiſe collapſe, and ſink inward, and thus prevent our ſeeing the Direction and Diſtinction of ſeveral of the Muſcles belonging to it.

482. The Thyro-Pharyngæi are very broad, and each Muſcle is inſerted along the outſide of the Ala of the Cartilago Thyroides, between the Edge of that Cartilage and the oblique Line in which the Thyro-Hyoidæi are fixed; and they are a little confounded with the Crico-Hyoidæi. From thence they run up obliquely backward, and meeting under the Linea Alba, they ſometimes appear to be but one Muſcle without any middle Tendon. Sometimes they have appeared to me to be diſtinguiſhed into Superior and Inferior, becauſe their upper Portion ran upward and backward, and their lower Portion more tranſverſely.

483. The Crico-Pharyngæi are inſerted each in the lower part of the ſide of the Cricoide Cartilage. They ſeem to be Appendices of the Thyro-Pharyngæi, ſhewing no other marks of Diſtinction but theſe Inſertions, and a ſmall difference in Direction, becauſe as they run backward they deſcend a little. For this reaſon I have ſometimes looked upon theſe two Muſcles to be one, and have called it Thyro-Crico-Pharyngæus.

484. The loweſt of theſe muſcular Fibres make a compleat Circle backward, between the two ſides of the Baſis of the Cartilago Cricoides. This Circle is the beginning of the Œſophagus, and has been thought by ſome, to form a diſtinct Muſcle, called Œſophagæus. I have found another Faſciculus of Fibres detached from the Thyro-Pharyngæus, and inſerted laterally in the Thyroide-Gland, for which reaſon I call it Muſculus Thyro-Adenoidæus.

485. The particular uſes of all theſe Muſcles are very difficult to be determined. It is certain that thoſe of the middle and lower Portions of the Pharynx ſerve chiefly for Deglutition. Thoſe of the upper Portion, and ſome of thoſe of the middle Portion may, among other Functions, be uſeful in modifying the Voice, according to the opinion of *M. Santorini*.

### §. 3. *The Palate, Uvula, &c.*

380. The Palate is that Arch or Cavity of the Mouth, ſurrounded anteriourly by the Alveolary Edge and Teeth of the upper Jaw, and reaching from thence to the great Opening of the Pharynx. This Arch is partly ſolid and immoveable, and partly ſoft and moveable. The ſolid Portion is that which is bounded by the Teeth, being formed by the two Oſſa Maxillaria, and two Oſſa Palati. The ſoft Portion lies behind the other, and runs backward like a Veil fixed to the Edge of the Oſſa Palati, being formed partly by the common Membrane of the whole Arch, and partly by ſeveral muſcular Faſciculi, &c.

487. The Membrane that covers all this Cavity is like that which lines the ſuperior and middle Portions of the Pharynx. It is very thick ſet

with ſmall Glands, the Orifices of which are not ſo ſenſible as in the Pharynx, and eſpecially in the Rugæ of the ſuperior Portion thereof, where *M. Heiſter* obſerved a conſiderable Orifice, and a Canal proportioned to that Orifice which he could eaſily inflate with Air. This is certainly the beſt way of beginning theſe kinds of Inquiries, eſpecially if the Pipe be held at firſt only very near the part, without endeavouring to force it in. To immerge the Parts in clear Water in the manner already mentioned, is likewiſe a very good way to diſcover ſmall Orifices, by the help of a Microſcope. Small Ducts of the ſame kind with what I have now mentioned, may be ſuppoſed to lie along the middle Line or Raphe of the Arch of the Palate, and along the Alveolary Edge, becauſe of ſome ſmall Tubercles or Points which appear there.

488. This Membrane, together with that of the poſterior Nares, forms by an uninterrupted continuation, the anterior and poſterior Surface of the ſoft Portion, or Septum Palati; ſo that the muſcular Faſciculi of this Portion lie in the Duplicature of a Glandulous Membrane. The Muſcles compoſed of theſe Faſciculi ſhall be preſently deſcribed.

489. The Septum which may likewiſe be termed Velum, or Valvula Palati, terminates below by a looſe floating Edge, repreſenting an Arch ſituated tranſverſely above the Baſis or Root of the Tongue. The higheſt Portion or Top of this Arch ſuſtains a ſmall, ſoft, and irregular conical glandulous Body, fixed by its Baſis to the Arch, and its Apex hanging down without adhering to any thing, which is called Uvula.

490. On each ſide of the Uvula there are two muſcular half Arches, called Columnæ Septi Palati. They are all joined to the Uvula by their upper Extremities, and diſpoſed in ſuch a manner, as that the lower Extremities of the two which lie on the ſame ſide, are at a little diſtance from each other, and ſo as that one half Arch is anterior, the other poſterior, an oblong triangular Space being left between them, the Apex of which is turned toward the Baſis of the Uvula.

491. The two half Arches on one ſide, by joining the like half Arches on the other ſide, form the intire Arch of the Edge of the Septum. The poſterior half Arches run by their upper Extremities, more directly toward the Uvula than the anterior. The anterior half Arches have a continuation with the ſides of the Baſis of the Tongue, and the poſterior, with the ſides of the Pharynx. At the lower part of the Space left between the lateral half Arches on the ſame ſide, two Glands are ſituated termed Amygdalæ, which ſhall be deſcribed hereafter, together with the glandular Structure of the Uvula, among the other Glands of the Mouth.

492. The half Arches are chiefly made up of ſeveral flat fleſhy Portions, almoſt in the ſame manner with the Body of the Septum. The Membrane which covers them is thinner than the other parts of it towards the Palate, Pharynx and Tongue. Each Portion is a diſtinct Muſcle, the greateſt part of which terminate by one Extremity in the Subſtance of the Septum and of the half Arches, and by the other Extremity in parts different from theſe.

493. As Anatomiſts uſed formerly to aſcribe all theſe Muſcles, as far as they knew them, to the Uvula, without any regard to the Septum, they termed them in general either Ptery-Staphylini, or Peri-Staphylini. The laſt part of theſe two compound Words expreſſes the Uvula; the firſt part of the firſt Word is an abridgment of Pterygoides, and expreſſes the Inſertion of theſe Muſcles, but the firſt part of the ſecond Word ſignifies no more than round, or about, &c.

494. I ſhould be very glad to make uſe of the term Peri-Staphylinus as a general denomination for the Muſcles belonging to the Septum, and then to add the other terms, of which theſe names have been made up by modern Writers. But leſt I ſhould be thought to affect a Language different from the common, I ſhall retain the ordinary names, only deſiring the Reader to take notice that by the term Staphylini I do not mean preciſely the Uvula, but only the parts round it. If we could be allowed to frame names of Greek and Latin words compounded together, we might for example, ſay Gloſſo-Palatinus, inſtead of Gloſſo-Staphylinus. I ſhall call the Muſcles that go to the Uvula, ſimply Staphylini, or Epiſtaphylini, becauſe that part reſembles a ſmall Bunch of Grapes, according to the Signification of the Greek word. From what has been ſaid, I name theſe Muſcles in the following manner.

Gloſſo-Staphylini.
Pharyngo-Staphylini.
Thyro-Staphylini.
Pterygo-Staphylini.
Spheno-Salpingo-Staphylini, called commonly Peri-Staphylini Externi.
Pterygo-Staphylini Superiores.
Pterygo-Staphylini Inferiores.
Pterygo-Salpingo-Staphylini, called commonly Ptery-Staphylini Interni.
Staphylini ſive Epiſtaphylini.

495. The Gloſſo-Staphylini are two ſmall Muſcles, fixed each in the lower and lateral part of the Baſis of the Tongue; from whence they run up obliquely backward, along the anterior half Arches of the Septum Palati, and terminate inſenſibly on each ſide near the Uvula, ſome of their Fibres being ſpread through the Septum. The thickneſs of the anterior half Arches is chiefly owing to theſe two Muſcles.

496. The Pharyngo-Staphylini are likewiſe two ſmall Muſcles, each of them being fixed by one Extremity to the lateral part of the Muſculi Thyro-Pharyngæi, as if they were Portions detached from theſe Muſcles. From thence they run up obliquely forward along the two poſterior half Arches of the Septum, and terminate in the Septum above the Uvula, where they meet together, and ſeem to form an intire Arch by the Union of their Fibres. The thickneſs of the two poſterior half Arches is owing to theſe Muſcles.

497. The Thyro-Staphylini are two ſmall Muſcles, which accompany the Pharyngo-Staphylini very cloſely, through their whole courſe, except that their poſterior Extremities are fixed in the Thyroide Cartilages near the other Muſcles. They likewiſe contribute to the thickneſs of the poſterior half Arches, and are inſerted in the Septum in the ſame manner with the former. Theſe two Pairs of Muſcles may be made one Pair, and may be called Thyro-Pharyngo-Staphylini.

498. The Spheno-Salpingo-Staphylini are each fixed by one Extremity, partly to the Sphenoidal ſide of the bony Portion of the *Euſtachian* Tube, partly to the neareſt ſoft Portion of the ſame Tube. From thence it runs toward the external Ala of the Apophyſis Pterygoides, into which one Portion of this Muſcle is inſerted. The other Portion runs to the end of the Ala, and turns round to the forked Extremity thereof as over a Pulley, and is afterwards inſerted in the Septum Palati near the Uvula.

499. I look upon theſe two Portions as two diſtinct Muſcles, one of which ending in the Ala, ſeems only to ſerve for the Dilatation of the Tuba *Euſtachiana*. The other Portion is a true Spheno-Staphylinus, and as it has likewiſe an Inſertion in the Tube, it may be termed Spheno-Salpingo-Staphylinus, or Staphylinus Externus. This is the Muſcle commonly called Peri-Staphylinus Externus.

500. The Pterygo-Staphylinus Superior is only the external Portion of the Muſcle laſt deſcribed; and this name may likewiſe be given it, becauſe it has a ſmall Inſertion in the upper part of the Apophyſis Pterygoides, beſides that in the Sphenoidal part of the bony Portion of the Tube. The Pterygo-Staphylinus Inferior on each ſide, is a ſmall Muſcle inſerted by one Extremity in the Uncus Pterygoidæus, and by the other in the Septum near the Uvula. This Obſervation we owe to *M. Heiſter*.

501. The Petro-Salpingo-Staphylini, or Salpingo-Staphylini Interni are thoſe which are commonly called Peri-Staphylini Interni. Each Muſcle is fixed by one Extremity, partly to the inner ſide of the bony Portion of the *Euſtachian* Tube, or that next the Apophyſis Petroſa, partly along the Cartilaginous Portion of the ſame Tube. From thence it paſſes a little way under the ſoft membranous part, and toward what I called the half Pad of the Tube, and then turning toward the Septum, is fixed in the Edge, and partly in the upper ſide thereof.

502. The Staphylini, or Epiſtaphylini are two ſmall fleſhy Ropes, cloſely united together, as if they made but one Muſcle, but in ſome Subjects they are diſtinguiſhed by a very fine white Line. They are fixed by one Extremity in the common point of the poſterior Edges of the Oſſa Palati, and from thence run downward and backward along the middle of the Septum, and likewiſe along the middle of almoſt the whole Uvula. Theſe Muſcles have been termed Azygos *Morgagnii* from the Diſcoverer, but he conſidered them as one Muſcle. The Pterygo-Staphylini Inferiores are of the ſame kind, and might be termed Staphylini, or Epiſtaphylini Laterales, and theſe laſt, Medii.

503. The Septum Palati ſerves to conduct the Lacrymal Lympha, and that which is continually collected on the Arch of the Palate, into the Pharynx. It ſerves for a Valve to hinder what we ſwallow, and eſpecially what we drink, from returning by the Nares. The uſes of the different Muſcles of the Septum are not as yet ſufficiently known, nor the different Motions of which it is capable, as may be obſerved by looking for ſome time into an healthy Perſon's Mouth opened wide. I ſhall endeavour to explain theſe things at greater length in another place.

## §. 4. *The Tongue.*

504. Every one knows that the Tongue is a ſoft fleſhy Body, which fills all that part of the Cavity of the Mouth that is ſurrounded by the Alveolary Border and Teeth of the lower Jaw, and extends ſtill further back. All this Space is therefore in a manner the Mould and Meaſure of the length and breadth of the Tongue, as well as of its Thickneſs and Figure.

505. The Tongue is divided into the Baſis and Point; the upper and under ſides; and the lateral Portions or Edges. The Baſis is the poſterior and thickeſt part; the Point, the anterior and thinneſt part. The upper ſide is not quite flat, but a little convex, and divided into two lateral Halves, by a ſhallow depreſſed Line, called Linea Linguæ Mediana. The Edges are thinner than the other parts, and a little rounded as well as the Point. The lower ſide reaches only from the middle of the length of the Tongue to the Point.

506. The Tongue is principally compoſed of very ſoft fleſhy Fibres, intermixed with a particular medullary Subſtance, and diſpoſed in various manners. Many of theſe Fibres are confined to the Tongue without going any farther, the reſt form ſeparate Muſcles which go out from it in different ways, and are inſerted in other parts. All the upper ſide of the Tongue is covered by a thick Membrane of a Papillary Texture, upon which lies another very fine Membrane like a kind of Epidermis, which is likewiſe continued over the lower ſide, but without Papillæ.

507. Three ſorts of Papillæ may be diſtinguiſhed in the upper ſide of the Tongue; Capitatæ, Semi-Lenticulares and Villoſæ. Thoſe of the firſt kind are the largeſt, reſembling little Muſhrooms with ſhort Stems, or Buttons without a neck. They lie on the Baſis of the Tongue in ſmall ſuperficial Foſſulæ.

508. They reſemble ſmall conglomerate Glands ſeated on a very narrow Baſis, and each of them has ſometimes a ſmall Depreſſion in the middle of their upper or convex ſide. They occupy the whole Surface of the Baſis of the Tongue, and they are ſituated near each other in ſuch a manner as that the moſt Anterior form an Angle. They are Glandular Papillæ or ſmall ſalival or mucilaginous Glands, of the ſame kind with thoſe that are to be deſcribed hereafter.

509. We oftentimes obſerve about the middle of this part of the Tongue a particular Hole of different Depths, the inner Surface of which is intirely Glandular, and filled with ſmall Papillæ, like thoſe of the firſt kind. It is called Foramen Cæcum *Morgagnii*, as being firſt deſcribed by that Author. Since that time *M. Vaterus* has diſcovered a kind of Salival Ducts belonging to it; and *M. Heiſter* found two of theſe Ducts very diſtinctly, the Orifices of which were in the bottom of the Foramen Cæcum near each other. He obſerved the Ducts to run backward, divaricating a little from each other, and that one of them terminated in a ſmall oblong Veſicle ſituated on the ſide of the ſmall Cornu of the Os Hyoides.

510. The Papillæ of the ſecond kind or Semilenticulares, are ſmall orbicular Eminences, only a little convex, their circular Edge not being ſeparate from the Surface of the Tongue. When we examine them in a ſound Tongue with a good Microſcope, we find their convex ſides full of ſmall Holes or Pores, like the End of a Thimble.

511. They lie chiefly in the middle and anterior Portions of the Tongue, and are ſometimes moſt viſible on the Edges, where they appear to be very ſmooth and poliſhed even to the naked Eye, and ſometimes in living Subjects. They ſoon loſe their conſiſtence after Death, ſo that by rubbing them ſeveral times, they may be drawn out in form of ſmall ſoft Pyramids inclined to one ſide.

512. The Papillæ of the third kind or Villoſæ are the ſmalleſt and moſt numerous. They fill the whole Surface of the upper ſide of the Tongue, and even the Interſtices between the other Papillæ. They would be more properly named Papillæ Conicæ than Villoſæ, from the Figure which they appear to have when examined through a Microſcope in clear Water. They are naturally ſoftiſh, but they become extremely flaccid after Death; ſo that by handling them they may be made ſhort and thick, whereas they are naturally long and ſmall.

513. The fleſhy Fibres of which the Tongue is compoſed, and which go no further than the Tongue, may be termed Muſculi Linguæ Interiores, or the Intrinſick Muſcles, and they are the ſame which *Spigelius* named Muſculi Linguales. The Fibres theſe Muſcles conſiſt of, are of three general kinds, Longitudinal, Tranſverſe, and Vertical; and each of theſe Situations admits of different degrees of Obliquity. The longitudinal Fibres point to the Baſis and Apex of the Tongue, and ſeem partly to be Expanſions of the Muſculi Stylo-Gloſſi, Hyo-Gloſſi, and Genio-Gloſſi, of which hereafter. The vertical Fibres ſeem likewiſe to be in part produced by the ſame Genio-Gloſſi, and the tranſverſe, by the Mylo-Gloſſi.

514. Besides theſe mixed Productions, there is a diſtinct Plane of longitudinal Fibres, which run near the Surface of the upper ſide of the Tongue, and a diſtinct tranſverſe Plane under them. All theſe Fibres are partly interwoven, one Portion of them terminating at the two Edges of the Tongue, and the other at the Baſis and Point, without going to any other part; and they lie immediately above thoſe that belong to the Genio-Gloſſi. To diſcover all theſe different Fibres, and their different degrees

of Direction, we need only cut the Tongue longitudinally, after it has been boiled, or long macerated in ſtrong Vinegar.

515. The Extrinſick Muſcles, or Muſculi Exteriores, are thoſe which by one Extremity make a part of the Body of the Tongue, and are fixed by the other in ſome part without the Tongue. Of theſe we commonly reckon four Pairs:

Mylo-Gloſſi.
Stylo-Gloſſi.
Hyo-Gloſſi.
Genio-Gloſſi.

516. The Muſcles which move the Os Hyoides, already deſcribed in Sect. 3. belong likewiſe to the Tongue, and are the principal Directors of its Motions. The names of theſe Muſcles may be remember'd to be as follow.

Mylo-Hyoidæi.
Genio-Hyoidæi.
Stylo-Hyoidæi.
Omo-Hyoidæi.
Sterno-Hyoidæi.

517. The Mylo-Gloſſi are ſmall fleſhy Planes ſituated tranſverſely, one on each ſide, between the Ramus of the lower Jaw, and the Baſis of the Tongue. Their Inſertion in the Jaw is immediately above the poſterior half of the Mylo-Hyoidæus, between the prominent oblique Line on the inſide of the Bone, and the Dentes Molares. From thence they run toward the Baſis of the Tongue, and are loſt there on one ſide of the Gloſſo-Pharyngæi. Theſe Muſcles are often wanting:

518. The Stylo-Gloſſi are two long ſmall Muſcles which run down from the Styloide Apophyſes or Epiphyſes, and form two Portions of the lateral parts of the Tongue. Each Muſcle is fixed in the outſide of the Apophyſis Styloides by a long Tendon, being the uppermoſt of the three Muſcles fixed in that Apophyſis, which at *Paris*, go by the name of *Riolan*'s Noſegay. The Stylo-Hyoidæus is the loweſt, and the Stylo-Pharyngæus is in the middle, but more backward.

519. As it runs down almoſt oppoſite to the inſide of the Angle of the Lower Jaw, it ſends off a pretty broad and ſhort lateral Aponeurotic Ligament, which being fixed in that Angle, ſerves for a Frænum, or Ligamentum Suſpenſorium to the Muſcle in this part of its Courſe. From thence it paſſes on to the ſide of the Baſis of the Tongue, where it firſt of all adheres cloſely to the lateral Portion of the Hyo-Gloſſus, and then forms together with that Muſcle, a large Portion of the ſide of the Tongue.

520. The Hyo-Gloſſi are each inſerted in three parts of the Os Hyoides that lie near each other; in the Baſis, in the Root of the great Cornu, and in the Symphyſis between theſe two; and on this account the Hyo-Gloſſus has been divided by ſome into two or three diſtinct Muſcles called Baſio-Gloſſus, Cerato-Gloſſus, and Chondro-Gloſſus. In ſome Subjects they may eaſily be ſeparated, the three Portions being ſimply contiguous to each other; but it is needleſs to burden the Memory with ſo many uſeleſs names, and therefore I deſcribe them all as one Muſcle, by the name of Hyo-Gloſſus.

521. It is ſituated on the inſide, and a little lower than the Stilo-Gloſſus, with which it forms the lateral part of the Tongue. The Portion inſerted in the Baſis of the Os Hyoides lies more anteriourly, and is larger than the other two; that which is inſerted in the Symphyſis is the leaſt, and that inſerted in the great Cornu, the moſt poſterior. This Muſcle is partly ſuſtained by the Mylo-Hyoidæus, as by a Girth; and the anterior Portion is diſtinguiſhed from the reſt by the paſſage of the Nerves of the fifth Pair, and of the Arteries which accompany them.

522. The Genio Gloſſi are ſituated cloſe to each other on the lower ſide of the Tongue. Each Muſcle is inſerted in the inner or backſide of the Symphyſis of the Lower Jaw, immediately above the Genio-Hyoidæus. From thence it runs backward toward the Os Hyoides, to which the loweſt Fibres are connected by a Ligamentary Membrane; and in this courſe its Fibres are ſpread through the Subſtance of the Tongue in a very ſingular manner.

523. Of theſe Fibres, ſome run directly toward the Os Hyoides, all the way to the Baſis of the Tongue; ſome are inflected forward, and go to the Point of the Tongue; and the reſt are diſtributed in a radiated manner, forward, upward, and backward in the Subſtance of the Tongue; and the middle Fibres expand laterally toward the Edges of the Tongue.

524. The two Genio-Gloſſi run cloſe to each other, as if they formed but one Maſs; but they are evidently divided by a very thin cellular Membrane, or middle Septum, which penetrates a good way between the two lateral, or right and left Halves of the Tongue, lying in the ſame Plane with the Linea Mediana of the upper ſide of the Tongue.

525. When we ſeparate theſe two Muſcles from the Chin, they preſently contract ſo much, that their anterior Extremities which lay under the Point of the Tongue, are as far back as the middle of it. It is in this preternatural Situation that we ſee theſe Muſcles repreſented in Figures given by very great Anatomiſts, and drawn and engraved by very good Artiſts, in which Figures the whole Beauty of their true Mechaniſm is loſt.

526. These two Muſcles by their poſterior ſtreight Fibres which go to the Baſis, can draw the Tongue out of the Mouth, and bring it back again by their anterior bent Fibres which go to the Point. They can either ſucceſſively, or all at once, make the Tongue longitudinally hollow

or like a Groove; and they can at the ſame time contract it, by the latera Expanſion of their middle Fibres. I paſs over many other Motions which theſe Muſcles are capable of performing, from whence I formerly uſed in my private Courſes to call them Muſculi Polychreſti.

527. When either of the Stylo-Gloſſi acts, it turns the Tongue toward the Cheek, and forces the Aliment between the upper and lower Molares. When they act jointly with the lateral Portions of the ſuperior fleſhy Plane of the Tongue, they turn the Tongue obliquely upward to the Teeth of the upper Jaw, and near the Cheeks, as when we bring down any part of the Food that may have ſtuck there, after Maſtication. When they act jointly with the lateral Portions of the Hyo-Gloſſi, they turn the Tongue downward between the lower Teeth and the Cheek.

528. When all the parts of the Hyo-Gloſſi act together, they ſhorten the Tongue. They likewiſe turn the Point of the Tongue between the Teeth and the under Lip, and make it paſs over that Lip. The ſuperior fleſhy Plane of the Body of the Tongue, bends it upward toward the Palate, and makes it paſs along or lick the upper Lip. The Mylo-Gloſſi ſerve as a Frænum to one ſide of the Baſis, while the Point is turned to the other ſide. The Ligamenta Suſpenſoria of the Stylo-Gloſſi may anſwer the ſame purpoſe, and even ſupply the want of the Mylo-Gloſſi.

529. Besides the Membranes of the Tongue already deſcribed, it is cuſtomary to mention another, called Membrana Reticularis, which is commonly demonſtrated from the boiled Tongues of Oxen or Sheep; and ſome pretend to have ſhewed it in the Human Tongue, which I own I have never been able to do. It is now a long time ſince I ſhewed that what they take from the Tongues of Oxen and Sheep is not a true Membrane, but a kind of clear mucilaginous Subſtance, which lies between the papillary and external Membranes, and which by boiling, becomes white, and acquires Solidity enough to be taken out in large Portions, and that the Holes found in it are owing to the ſmall pyramidal Papillæ.

530. The Tongue is fixed in the Mouth, not only by Muſcles, but alſo by Ligaments, which are for the moſt part Membranous. The principal Ligament is that called the Frænum, which is the prominent Fold that appears firſt under the Tongue, when we raiſe it, with the Mouth opened, and is no more than a Continuation or looſe Duplicature of that Membrane, which covers the inferior Cavity of the Mouth. It covers the Curvature of the anterior Portion of the Genio-Gloſſi from the Point of the Tongue, almoſt as high as the middle Interſtice between the lower Dentes Inciſorii.

531. The other Ligaments of the Tongue are the ſmall membranous Fold which runs along the middle of the convex ſide of the Epiglottis to the Baſis of the Tongue; and the membranous Folds which cover the inferior half Arches of the Septum Palati. Theſe three Folds are Continuations of the Membrane which covers the neighbouring parts. The Aponeurotic Ligaments of the Stylo-Gloſſus may be looked upon as true lateral Liga-

ments of the Tongue; and they adhere a little to the lower part of the Muſculus Pterygoidæus Internus, or Anterior.

532. The principal Blood-Veſſels of the Tongue are thoſe that appear ſo plainly on its lower Surface, on each ſide of the Frænum; and they conſiſt of one Artery and one Vein, which accompany each other, and are called Arteriæ & Venæ Sublinguales or Raninæ. The Veins lie next the Frænum, and the Arteries on the other ſide of the Veins. The Arteries are Rami of the ſecond internal or anterior Branch of the external Carotid on each ſide, and communicate with the firſt external or poſterior Branch of the ſame Carotid, &c. The Veins are commonly Rami of a Branch of the external anterior Jugular Vein, deſcribed among the other Veins, Sect. 5. N° 79.

533. We obſerve four nervous Ropes to go very diſtinctly to the Baſis of the Tongue, and to continue their courſe through its whole Subſtance all the way to the Point. Two of theſe Ropes are Rami of the inferior maxillary Nerves, or of the third Branch of the fifth Pair from the Medulla Oblongata. The other two are the Nerves of the ninth Pair. The two firſt I have already named Linguales or Hypo-Gloſſi Minores, and the other two Linguales or Hypo-Gloſſi Majores. The Majores are inferior and internal, the Minores, ſuperior and external, or lateral. The ſmall Portion or firſt Branch of the Nervus Sympatheticus Medius, or of the eighth Pair, ſends likewiſe a Nerve to each ſide of the Tongue.

534. The great Lingual Nerve on each ſide runs forward between the Muſculus Mylo-Hyoidæus and Hyo-Gloſſus, under the Genio-Gloſſus, and is diſtributed to the fleſhy Fibres all the way to the Point of the Tongue, communicating by ſeveral ſmall Filaments with the Lingualis Minor, and with the Nerve from the eighth Pair. For the other Diſtributions of it, I refer to the Deſcription of the Nerves.

535. The ſmall Lingual Nerve on each ſide goes off from the Maxillaris Inferior, ſometimes at and ſometimes before its paſſage between the Pterygoide Muſcles. Afterwards ſeparating more and more from the Trunk, it paſſes under the lateral part of the Tongue, over the Sublingual Gland, of which hereafter. It ſupplies the neareſt parts of the Tongue as it paſſes, and then entering its Subſtance, terminates at the Point, having ſent a great number of Filaments to the Papillary Membrane. It communicates, as has been ſaid, with the Lingualis Major, and with the Nerve from the eighth Pair.

536. This Lingual Nerve, a little after it leaves the Maxillaris Inferior, is accompanied by a ſmall diſtinct Nerve, which runs upward and backward toward the Articulation of the Lower Jaw, in company with the lateral Muſcle of the Malleus, paſſes through the Tympanum between the Handle of the Malleus and the long Leg of the Incus, by the name of Chorda Tympani, and afterwards perforating the backſide of the Tympanum, unites with the Portio Dura of the Auditory Nerve, as has been already ſaid in the Deſcription of the Ear.

537. This ſmall Nervous Rope has been looked upon by Anatomiſts as a kind of ſmall Recurrent of the Nervus Lingualis; but as in ſome Subjects it appears to make ſimply an acute Angle with the Lingual Nerve, and as this Lingual Nerve is ſomething larger after this Angle, it ought rather to be believed to come from the Tympanum, and to unite with the Lingual Nerve, than to ariſe from this Nerve, and run up to the Tympanum. In ſome Subjects the Union of this Nerve with the Lingualis is in a manner Plexiform, and very difficult to be unfolded.

538. The Lingual Nerve of the eighth Pair, which is its firſt Branch, runs firſt of all on the inſide of the Digaſtric Muſcle of the Lower Jaw, and ſupplies the Genio-Hyoidæi, the neighbouring Muſcles of the Baſis of the Tongue and thoſe of the Pharynx. Afterwards it ſends out the Ramifications, and forms the Communications deſcribed in the Hiſtory of the Nerves; and laſtly goes to the lower part of the Tongue, where it communicates with the Lingual Ramus of the fifth Pair, and with the Lingual Ramus of the ninth.

539. The Tongue is the Organ of the Senſe, called the Taſte, by means of the Papillæ, eſpecially the Villoſæ or Pyramidales. It is not as yet diſcovered in what manner the Papillæ Semi-lenticulares contribute to the Taſte; and the Capitatæ ought to be looked upon as Salival Glands.

540. The Tongue is likewiſe one of the principal Inſtruments of Speech, and of the Articulation of the Voice. *Riolan* in his Anthropographia mentions a Child of five Years of Age, who though he had loſt his Tongue by the Small-Pox, but not the Uvula, continued ſtill to ſpeak almoſt as diſtinctly as before. Probably the Baſis of the Tongue ſtill remained. *M. de Juſſieu* has publiſhed an Obſervation in the Memoirs of the Royal Academy concerning a little Girl who could ſpeak, though ſhe was born without a Tongue, in room of which there was only a kind of ſmall Tubercle.

541. The Tongue ſerves alſo to collect all the Morſels which we chew, to turn them in different manners and to different parts of the Mouth, and to rub off whatever ſticks to the Palate; and it is uſeful in Spitting, Sucking, &c. It bears a great part in Deglutition, being aſſiſted by the Digaſtric Muſcles, which by contracting at the ſame time that the other Muſcles preſs the lower Jaw againſt the upper, raiſe the Os Hyoides, and fix it at a convenient height, that the Stylo-Gloſſi and Hyo-Gloſſi may make the Baſis of the Tongue bear back upon the Morſel which is to be ſwallowed, and ſo force it into the Pharynx, the Portions of which that are at that time immediately above the Morſel, do inſtantly contract, and puſh it into the Œſophagus.

### §. 5. *The Cheeks, Lips, and Gums.*

542. The Cheeks and Lips from the ſides and entry of the Cavity of the Mouth. They are formed in general by the Connexion of ſeveral fleſhy Portions of different breadths, fixed round the convex ſides of the two

Jaws, covered on the outſide with the Skin and Fat, and lined on the inſide by a glandulous Membrane. Beſides all this, the Lips ſeem likewiſe to have a ſoft ſpungy Subſtance in their Compoſition, which ſwells and ſubſides on certain occaſions independently of the Action of the Muſcles belonging to them, and is mixed with Fat.

543. The Subſtance which forms the red Border of the Lips is very different from the reſt of the Skin, being a Collection of very fine, long, villous Papillæ, cloſely connected together and covered by a fine Membrane, which ſeems to be both a Continuation of the Epidermis, and of that Pellicle which covers the glandulous Membrane of the Cavity of the Mouth. This Subſtance is extremely ſenſible, and very painful when the outer Membrane is by any accident deſtroyed. The internal Membrane of the upper Lip forms a ſmall middle Frænum above the firſt Dentes Inciſorii.

544. The Gums are that reddiſh Subſtance like Leather, which covers the two ſides of the whole Alveolary Border of both Jaws, inſinuates itſelf between all the Teeth, ſurrounds what I called the Collar of each Tooth in particular, and adheres very ſtrongly to them. Therefore the outer and inner Gums are continuous, and both together form juſt as many Openings as there are Teeth.

545. The Subſtance of the Gums is of a very ſingular Structure, reſembling in ſome meaſure the Texture of a Hat, ſuppoſed to be very compact and elaſtic. It is not immediately fixed to the Bones of the Jaws, but by the Intervention of the Perioſteum with which it is perfectly united; and it is covered by a fine, ſtrong, even Membrane, which ſticks very cloſe to the Subſtance of the Gums, and ſeems to be a Continuation of that thin Membrane which goes to the Lips and Cheeks, and of that which goes to the Tongue.

546. The Arteries which go to the Lips, Cheeks and Gums are Ramifications of the external Carotid, and chiefly of thoſe Branches called Maxillares Externæ & Internæ, of which I deſire the Reader to conſult the Diſtributions and different Communications in the Deſcription of the Arteries N° 55, 58. The Veins are Ramifications of the external anterior Jugular.

547. The Nerves of theſe Parts come from the Maxillaris Superior and Inferior, which are Branches of the fifth Pair; and alſo from the Portio Dura of the Auditory Nerve, or Sympatheticus Minimus, the Ramifications of which are ſpread in great numbers on all theſe parts, and communicate in a pretty ſingular manner with the Nerves of the fifth Pair in ſeveral places, as may be ſeen in the Deſcription of the Nerves.

548. There is ſo much Variety to be met with in the Muſcles of the Lips in different Subjects, that it is not at all ſurpriſing to find the Deſcriptions given of them by Anatomiſts very unlike one another. In ſome Subjects Portions of theſe Muſcles are wanting; in ſome they can ſcarcely be diſtinguiſhed, becauſe of the paleneſs and attenuation of the Fibres; and in others there are really ſome particular Faſciculi which are not generally to

be found. About fifteen Years ago I diſſected an old woman, in which Subject alone I obſerved a great many ſingular things which I have not met with in great numbers of other Subjects more proper for Diſſection. In this Subject the Muſcles of the Face in general were very much multiplied, and very diſtinct, as I ſhall ſhew in particular Obſervations.

549. The Muſcles of the Lips are commonly divided into common and proper. The common Muſcles are thoſe which end at the Angles or Commiſſures of the two Lips; and thoſe are proper which are fixed in one Lip only, which are again ſubdivided into proper Muſcles of the upper Lip, and proper Muſcles of the under Lip. All theſe Muſcles have particular names, ſome of which are taken from ſomething in the Conformation of the Muſcles, ſome from the Inſertions or Situation, and ſome from the Uſes attributed to them

550. I ſhall here deſcribe thoſe which I am able to ſhew, without mentioning thoſe which I have not hitherto found, though I am in no doubt about the Accuracy of theſe great Anatomiſts who have publiſhed accounts of them, and who have beſides given unqueſtionable proofs of their being faithful and judicious Obſervers. I ſhall lay aſide the names taken from the ſuppoſed uſes, partly becauſe I have done ſo all along for reaſons already given, partly becauſe I am ſtill uncertain about ſome of the uſes attributed to them, and partly to encourage Anatomiſts and even Beginners to try their Hands at gueſſing, at which they may perhaps ſucceed better than I have done.

551. The Muſcles to which I confine my ſelf may be enumerated in the following Order.

*Muſculi Communes.*

Semi-Orbiculares.
Supra-Semi-Orbiculares.
Buccinatores.
Zygomatici Majores.

*Muſculi Proprii Labii Superioris.*

Zygomatici Minores.
Canini.
Inciſorii Laterales.
Inciſorii Medii.

*Muſculi Proprii Labii Inferioris*

Triangulares.
Triangularium Collaterales.
Quadratus.
Inciſorii Inferiores.
Cutanei.

552. The upper Lip is ſometimes moved by the Action of the Muſcles of the Noſe, eſpecially of the Pyramidales; and both Lips either jointly or ſeparately are moved by Suction, without the aſſiſtance of the Muſcles belonging to them.

553. The Semi-Orbiculares are commonly looked upon as one Muſcle, ſurrounding both Lips, from whence it is called Orbiculares; but when we examine carefully the Angles of the Lips, we find that the Fibres of the upper Lip interſect thoſe of the under Lip, and we eaſily diſtinguiſh the muſcular Arch of one Lip from that of the other; and for this reaſon I divide this Muſcle into two, and I call them either by the common name of Semi-Orbicularis, or I call one of them Semi-Orbicularis Superior, and the other Semi-Orbicularis Inferior; but the name of Semi-Ovales would be ſtill more proper.

554. The ſuperior Semi-Orbicular Muſcle is oftentimes broader than the inferior; and it has this peculiarity likewiſe, that all its Fibres do not go to the Corner of the Mouth, but terminate by degrees between the Middle and Extremities of this Arch, nearly like the Semi-Oval Fibres of the upper Palpebra. The inferior Semi-Orbicular Muſcle is commonly more uniform in the Diſpoſition of its Fibres.

555. The Supra-Semi-Orbiculares are Fibres which increaſe the breadth of the the two lateral Portions of the ſuperior Semi-Orbicularis, upward; and they appear at firſt ſight to be one continued Arch like the Muſcle laſt named, but being narrowly examined, they will be found to be ſeparated by a ſmall Interſtice, lying betwixt their contiguous Extremities which are fixed in the Gums oppoſite to the Edges of that Cutaneous Foſſula that runs down from the Septum Narium, to the middle of the Edge of the upper Lip. Their other Extremities are confounded with thoſe of the Semi-Orbicularis Superior.

556. The Buccinatores are two in number, each of them ſituated tranſverſely between the poſterior part of the two Jaws and the Corner of the Mouth. They are broad backward and narrower forward, in the Shape of a Triangle or Trapezium, and they form a conſiderable Portion of the Cheeks, and for that reaſon are ſometimes called the Muſcles of the Cheeks. To have a juſt Idea of theſe Muſcles, we muſt be made acquainted with a Ligament on each ſide of the Face which I call Ligamentum Inter-Maxillare, becauſe it connects the two Jaws, and alſo gives Inſertion to the poſterior Fibres of the Buccinator.

557. This Ligament is ſtrong and pretty broad. It is fixed by one end to the outſide of the upper Jaw above the laſt Dens Molaris, and at the ſide of the Apophyſis Pterygoides where it adheres very cloſely to the Muſculus Pterygoidæus Internus. By the other end it is fixed in the poſterior or ſuperior Extremity of the oblique prominent Line on the outſide of the lower Jaw, below the laſt Dens Molaris. It ſerves likewiſe as a Frænum to check and limit the Depreſſion of the lower Jaw in opening the Mouth, and we may feel it ourſelves, with the end of the Finger in the Mouth, eſpecially when it is wide open.

558. The Buccinator is inſerted poſteriorly in three different places. The middle Fibres are fixed tranſverſely in the Ligamentum Intermaxillare, and run directly to the Corner of the Mouth. The ſuperior Fibres run down in an oblique graduated manner, from the Alveoli of the upper Jaw to the Corner of the Mouth; and the inferior Fibres run up from the lower Jaw in the ſame manner. All theſe Fibres contract by degrees as they approach the Commiſſure of the Lips, where they run in behind the Extremities and Union of the Semi-Orbiculares, by which they are covered, and to which they adhere cloſely. There is a large Hollow between this Muſcle and the Maſſeter filled with Fat.

559. The Zygomatici Majores are two Muſcles ſituated, one on each ſide, between the Zygoma and the Corner of the Mouth. Each Muſcle is thin, long, oblique, and fixed by one Extremity to the lower Edge of that Portion of the Os Malæ, which is connected with the Zygomatic Apophyſis of the Os Temporis. From thence it runs down obliquely from behind forward, being in its paſſage, commonly involved in Fat. It ends at the Commiſſure of the two Lips, adhering ſtrongly to the Buccinator which covers it. This Muſcle is very often complex.

560. The Zygomatici Minores are two ſmall ſlender Muſcles, lying above the great Zygomatici, and almoſt parellel to them. Their ſuperior Extremity ſeems to be a detachment from the lower Fibres of the Orbicularis Palpebrarum; but they may always be diſtinguiſhed. Their lower Extremity unites with the neighbouring Inciſorius. Theſe Muſcles are quite buried in Fat, and for that reaſon often diſappear.

561. Each of the two Canini is fixed by a broad Inſertion in the upper Jaw above the Socket of the Dens Caninus, in a depreſſion below the inferior Edge of the Orbit near the Os Malæ. From thence it runs down a little obliquely, croſſing the lower Extremity of the Zygomaticus Major, which covers it at this place. Afterwards it terminates at the Extremity of the Arch of the Semi-Orbicularis Superior, and communicates by ſome Fibres with the Triangularis. I formerly looked upon this as a neutral Muſcle, that is, as being neither a proper Muſcle of the upper Lip, nor common to both.

562. Each of the two Inciſorii Laterales is a ſort of Biceps, its upper part being divided into two Portions which unite below. One of theſe ſuperior Portions is larger than the other, and is fixed in the Os Maxillare below the middle Tendon of the Orbicularis Palpebrarum, ſeeming to communicate by ſome Fibres with the contiguous Fibres of that Muſcle. From thence it runs down a little obliquely toward the Cheek, along the Apophyſis Naſalis, mixing with the Pyramidalis Naſi, and ſending ſome Fibres to the Nares. Afterwards it paſſes over and adheres to the Myrtiformis, or Tranſverſalis Naſi, and unites with the other Portion.

563. This other Portion is fixed by a broad Inſertion immediately below the Edge of the Orbit, in the Os Maxillare near the Union of this Bone with the Os Malæ, and likewiſe a little in the laſt named Bone, being at this place

covered by the inferior Portion of the Orbicularis Palpebrarum, with which it has ſometimes a kind of Communication. From thence it runs down obliquely toward the Noſe, and unites with the firſt Portion.

564. THE two Portions thus united and contracting in breadth, run behind the Semi-Orbicularis Superior, and are fixed therein oppoſite to the lateral Dens Inciſorius. Sometimes it ſends a ſmall Faſciculus of Fibres to the Muſculus Caninus, which may be reckoned an Aſſiſtant to that Muſcle, and named Caninus Minor.

565. THE Inciſorii Medii are commonly called Inciſorii Minores Cowperi or Inciſorii Minores Superiores. They are two ſmall ſhort Muſcles ſituated near each other below the Septum Narium. They are fixed by one Extremity in the Os Maxillare, on the Alveoli of the firſt Inciſores behind the Semi-Orbicularis Superior, and by their other Extremity in the middle and ſuperior part of the Subſtance of the upper Lip, near the Nares, in which they likewiſe have an Inſertion; and they ſometimes ſend lateral Fibres to the Semi-Orbicularis.

566. EACH of the two Triangulares is fixed by a broad Extremity in the outſide of the Baſis of the lower Jaw, from the Maſſeter to the Hole near the Chin. From thence it aſcends, contracting in breadth in a bent triangular Form, runs in between the Extremities of the Buccinator and Zygomaticus Major, to both which it adheres very cloſely, and terminates at the Commiſſure of the Lip, partly in the Semi-Orbicularis Superior, and partly though not always equally, in the Semi-Orbicularis Inferior. This Muſcle ſeems ſometimes to be a Continuation of the Caninus Major.

567. THE Quadratus forms the thick part of the Chin below the under Lip. It is a very complex Muſcle, and very difficult to be prepared, becauſe its Fibres are interwoven with a great Quantity of Fat or a pellicular Texture of the Membrana Adipoſa. It is firſt of all inſerted in the foreſide of the lower Jaw, where it partly fills the broad Foſſula on each ſide of the Symphyſis. From thence it runs up, interſecting, along the Symphyſis, the contiguous Fibres of the Skin, and terminates by a broad Inſertion in the Semi-Orbicularis Inferior. The Direction of the other Fibres of which it is compoſed, varies in different Subjects, and it communicates by ſome Fibres with the Cutanei.

568. THE Inciſorii Inferiores are two ſmall Muſcles, commonly mentioned with the addition of *M. Cowper*'s name. Each of them is fixed by the ſuperior Extremity, on the Alveoli of the lateral Inciſores of the lower Jaw. From thence they run down, approaching each other, and are inſerted together in the lower part of the middle of the Semi-Orbicularis Inferior.

569. ON the outſide of the ſuperior Inſertion of each of theſe Muſcles, we meet with a Faſciculus of Fibres which ſeem to be detached from it near the Inciſores. This Faſciculus goes off laterally in form of an Arch, and unites with the Fibres of the Semi- Orbicularis Inferior, with which it may be eaſily confounded. It may be looked upon as a Muſculus Acceſſorius to the Semi-Orbicularis Inferior, or as a Collateralis to the Inciſorius Minor.

570. The two Muſculi Cutanei form a kind of fleſhy Membrane, which covers the whole foreſide of the Throat and Neck, from the Cheek and Chin, all the way down below the Claviculæ, and adheres very ſtrongly to the Membranous or Aponeurotic Expanſion deſcribed above N° 196, 197. This Expanſion has a particular Adheſion to the anterior Portion of the Baſis of the lower Jaw, of the ſame kind with that at the lower part of the Zygoma, and it is ſpread over all the Muſcles that lie round the Neck, and over the upper Portion of the Pectorales Majores, Deltoides, and Trapezii.

571. The Fibres of each Cutaneous Muſcle run obliquely upward and forward, and meet and ſeem to interſect thoſe of the other Muſcle at acute Angles, from the Sternum all the way to the Chin. They adhere very cloſely to the Skin by the Intervention of the cellular Subſtance. From the Clavicles to the upper part of the Neck, theſe Muſcles are very thin, and from thence increaſe a little in thickneſs as they approach the Baſis of the lower Jaw, and eſpecially from the Maſſeter to the Chin.

572. They adhere ſtrongly to the lower Portion of the Maſſeter, Triangularis, and Quadratus, and on the Maſſeter and Buccinator their fleſhy Fibres become Aponeurotic, but continue longer on the Triangularis, being mixed with the Fibres of that Muſcle all the way to the Commiſſure of the Lips. They likewiſe advance a little on the neighbouring Portion of the Quadratus.

573. The Portion of theſe Muſcles which anſwers to the Baſis of the Triangularis, is in a manner divided into two fleſhy Laminæ, the outermoſt of which is what advances over the Triangularis and Quadratus, the other being inſerted ſeparately in the lower Jaw. I have ſometimes obſerved a part of the fleſhy Extremity of the right ſide, to paſs before the Symphyſis of the Chin, over a like part from the left ſide, the one covering the other.

574. The common Muſcles of the Lips either draw both Corners of the Mouth at once, or only one at a time, according to the different Direction of their Fibres. The proper Muſcles pull the different parts of the Lips in which they are inſerted. The Buccinators in particular may ſerve to move the Food in Maſtication. An intire Treatiſe might be written on the almoſt innumerable Combinations of the different Motions of all theſe Muſcles, according to the different Paſſions, and according to the different Poſtures in which a Man may put his Face, as I ſhall ſhew elſewhere. None are more affecting, than thoſe produced by the Cutanei alone, eſpecially in Weeping, which they do by their Adheſions to the Triangulares, &c. But by their Inſertions in the Bone of the lower Jaw, they draw up the lower part of the Integuments of the Neck, and thoſe of the Breaſt next to theſe; for they cannot move the Jaw. In old People, and in thoſe who are very much emaciated, theſe Muſcles may be perceived by the Eye, under the Chin, and on the Neck.

## §. 6. *The Salival Glands, &c.*

575. By Saliva we mean in general, that Fluid by which the Mouth and Tongue are continually moiſtened in their natural ſtate. This Fluid is chiefly ſupplied by Glands, called for that reaſon Glandulæ Salivales, of which they commonly reckon three Pairs, two Parotides, two Maxillares, and two Sublinguales. Theſe are indeed the largeſt, and they furniſh the greateſt quantities of Saliva; but there are a great number of other leſſer Glands of the ſame kind, which may be reckoned Aſſiſtants or Subſtitutes to the former. All theſe may be termed Salival Glands, and they may be enumerated in the following manner:

Glandulæ Parotides.
Glandulæ Maxillares.
Glandulæ Sublinguales.
Glandulæ Molares.
Glandulæ Buccales.
Glandulæ Labiales.
Glandulæ Linguales.
Amygdalæ.
Glandulæ Palatinæ.
Glandulæ Uvulares.
Glandulæ Arytenoidææ.
Glandula Thyroidæa.

576. The Parotides are two large, whitiſh Glands, irregularly oblong and protuberant, ſituated on each ſide, between the external Ear, and the poſterior or aſcending Ramus of the lower Jaw, and lying on ſome part of the neighbouring Maſſeter Muſcle. The ſuperior Portion of this Gland lies before the Cartilaginous Meatus of the Ear, and touches the Apophyſis Zygomatica of the Os Temporis; and it is extended forward and backward under the Lobe of the Ear, as far as the Maſtoide Apophyſis.

577. From the anterior and ſuperior Portion of this Gland, a white membranous Duct or Canal is produced by the Union of a great number of ſmall Tubes repreſenting ſo many Roots. This Duct runs obliquely forward on the outſide of the Maſſeter, and then perforates the Buccinator from without inward, oppoſite to the Interſtice between the ſecond and third Dentes Molares, where the Hole or Orifice repreſents the Spout of an Ewer.

578. This Canal is named Ductus Salivalis Stenonis, or Ductus Superior. It is about the twelfth part of an Inch in Diameter, and in ſome Subjects is partly covered by ſmall glandular Bodies, united with it in different quantities. The Arteria and Vena Angularis run up over this Duct, and the Por-

tio Dura of the Auditory Nerve runs through the Gland itſelf; and it alſo receives Filaments from the ſecond Vertebral Pair.

579. The Maxillary Glands are ſmaller and rounder than the Parotides, and are ſituated each on the inſide of the Angle of the lower Jaw, near the Muſculus Pterygoidæus Inferior. From the inſide, or that which is turned to the Muſculus Hyo-Gloſſus, each of them ſends out a Duct in the ſame manner as the Parotides, but it is ſmaller and longer, and goes by the name of Ductus Salivalis *Whartoni*, or Ductus Inferior.

580. This Duct advances on the ſide of the Muſculus Genio-Gloſſus, along the inner Part and ſuperior Edge of the Glandula Sublingualis, to the Frænum of the Tongue, where it terminates by a ſmall Orifice in form of a Papilla.

581. The Glandulæ Sublinguales are likewiſe two in number, of the ſame kind with the former, only ſmaller, ſomething oblong, and flatted like a blanched Almond. They are ſituated under the anterior Portion of the Tongue, one on each ſide, near the lower Jaw, on the lateral Portions of the Muſculi Mylo-Hyoidæi which ſuſtain them. The two Extremities of each Gland are turned backward and forward, and the Edges obliquely inward and outward.

582. They are covered on the upper ſide by a very thin Membrane, which is a Continuation of the Membrane that covers the under ſide of the Tongue. They ſend out laterally ſeveral ſmall ſhort Ducts which open near the Gums by the ſame number of Orifices, all ranked in the ſame Line, at a ſmall diſtance from the Frænum, and a little more backward. In many Animals we find particular Ducts belonging to theſe Glands, like thoſe of the Glandulæ Maxillares, but they are not to be found ſo diſtinctly in Men. The Muſculi Genio-Gloſſi lie between the two Sublingual Glands, and alſo between the two Maxillary Ducts.

583. The Molares are two Glands nearly of the ſame kind with the former, each of them being ſituated between the Maſſeter and Buccinator; and in ſome Subjects they may eaſily be miſtaken for two ſmall Lumps of Fat. They ſend out two ſmall Ducts which perforate the Buccinator, and open into the Cavity of the Mouth, almoſt over againſt the laſt Dentes Molares; and from thence *M. Heiſter*, who firſt deſcribed them, called them Glandulæ Molares.

584. All the inſide of the Cheeks near the Mouth, is full of ſmall glandulous Bodies, called Glandulæ Buccales, which open by ſmall Holes or Orifices through the inner Membrane of the Mouth. The Membrane which covers the inſide of the Lips, a Continuation of that on the Cheeks, is likewiſe perforated by a great number of ſmall Holes, which anſwer to the ſame number of ſmall Glands, called Glandulæ Labiales. The Glandulæ Linguales are thoſe of the Foramen Cæcum of the Baſis of the Tongue, which have been already ſpoken to.

585. I have alſo explained the Glandulæ Palatinæ, or thoſe that belong to the Arch and Septum of the Palate; and the Glandulæ Arytenoidææ

noidææ were deſcribed with the Larynx. The Uvular Glands are only a Continuation of the Membrane of the Palate in form of a ſmall Bunch of Grapes. We might likewiſe reckon among the Salival Glands thoſe of the ſuperior Portion of the Pharynx, mentioned in the Deſcription of that part, and alſo the glandular Bodies of the Membrana Pituitaria of the Nares, and of the Sinuſes that communicate with theſe.

586. The Amygdalæ are two glandular Bodies of a reddiſh Colour, lying in the Interſtices between the two lateral half Arches of the Septum Palati, one on the right, the other on the left ſide of the Baſis of the Tongue. Their appearance is not unlike that of the outſide of an Almond Shell, both becauſe their Surface is uneven, and becauſe it is full of Holes big enough to admit the Head of a large Pin.

587. These Holes which repreſent a Sieve, or a piece of Net-Work, are continued to an irregular Sinus or Cavity within the Gland, filled commonly with a viſcid Fluid, which comes from the bottom of the Sinus, and is from thence gradually diſcharged through theſe Holes into the Throat. To ſee the true Structure of the Amygdalæ, they muſt be examined in clear Water, having firſt been waſhed in lukewarm Water, and handled very gently.

588. The Thyroide Gland is a large whitiſh Maſs which covers the anterior convex ſide of the Larynx. It ſeems at firſt ſight to be made up of two oblong glandular Portions, united by their inferior Extremities, below the Cricoide Cartilage, in ſuch a manner as to have ſome reſemblance to a Creſcent, with the Cornua turned upward. It is of a moderate thickneſs, and bent laterally like the Thyroide Cartilage, from which its name is taken. The two lateral Portions lie on the Muſculi Thyro-Hyoidæi, and the middle, or inferior Portion, on the Crico-Thyroidæi. The Thyro-Pharyngæi Inferiores ſend Fibres over this Gland, and they communicate on each ſide by ſome ſuch Fibres, with the Sterno-Thyroidæi and Hyo-Thyroidæi.

589. This Gland ſeems to be of the ſame kind with the other Salival Glands, but it is more ſolid. Some Anatomiſts thought they had diſcovered the Excretory Duct, but they miſtook a Blood-Veſſel for it. We ſometimes meet with a kind of glandular Rope which runs before the Cartilago Thyroides, and diſappears before the Baſis of the Os Hyoides.

590. This glandular Rope goes out from the common Baſis of the lateral Portions of the Thyroide Gland, and is loſt between the Muſculi Sterno-Hyoidæi, behind the Baſis of the Os Hyoides, or between that Baſis and the Epiglottis. I have likewiſe ſhewn in my private Courſes, ſmall Openings on the ſide of the anterior Ligament of the Epiglottis, or that by which it is connected to the Baſis of the Tongue. One of theſe Openings appears like a ſmall Papilla ; and this is the furtheſt that I have been able to trace the glandular Rope.

## §. 7. *Glandulæ Limphaticæ.*

591. Below each of the firſt Salival Glands above deſcribed, or Parotides, toward the Maſtoide Apophyſis, is fixed a ſmall gland of another kind, differing from the former in Figure, Colour, Excretory Duct, and in the Fluid which it ſecretes. It is round, and of an even Surface, without tubercles, and it is the uppermoſt of a great number of Glands of the ſame kind, which lie partly below the Interſtice between the Parotid and Maxillary Glands and at different diſtances, along the internal Jugular Vein, all the way to the lower part of the Neck. We obſerve among theſe Glands and upon this Vein a great number of tranſparent Veſſels, with an appearance of numerous Valves. The Fluid which they contain is tranſparent, a little mucilaginous, and is called Lympha.

592. The Veſſels are likewiſe termed Lymphatic Veſſels, and the Glands, Lymphatic Glands. Theſe Glands are not all equally large, nor equally round, ſome being oblong, thick, flat, ſmall, &c. The Lymphatic Veſſels go out alternately by one Extremity, from one Gland, and enter by the other Extremity ſome other Gland near the former, and both as they go out and as they enter, theſe Extremities are very much ramified. The Trunk is commonly ſingle, and the Valves are ſo diſpoſed, as that the Fluid contained in the Veſſel can only run toward the Thorax, but cannot return to the Head.

593. These Glands and Veſſels are to be found in many other parts of the Body. We meet with them not only in ſeveral parts of the Head, but alſo in many outward and inward parts of the Thorax, Abdomen, and both Extremities. They accompany the maxillary Salival Glands, as well as the Parotides; and there are ſeveral ſpread on the lateral and backſides of the Neck, in the Membrana Adipoſa, near the Muſcles.

594. In the Cavity of the Thorax the Lymphatic Glands are ſituated at different diſtances on one ſide and behind the Œſophagus, eſpecially at the place which is even with the fifth Vertebra of the Back. I have found ſome on the anteriour Portion of the Diaphragm on one ſide of the Mediaſtinum; and there are others round the Baſis of the Heart, in the Fat which lies there. They are to be met with likewiſe in the Subſtance of the Membrana Adipoſa which covers the Thorax, near the inner Surface, eſpecially about the Clavicles, and in the cellular Interſtices of the Muſcles which lie on the Thorax.

595. In the Cavity of the Abdomen theſe Glands are very numerous, and particularly round the ſuperiour Orifice, and on the two Curvatures of the Stomach; on the Capſula of the Sinus of the Vena Portæ; on the cellular Ligament of the Veſicula Fellis; near the beginning of the Ductus Cyſticus; at the Adheſions of the Omentum to the Spleen, and to the Colon; through the whole extent of the Meſentery; at the Adheſions of the

Meſocolon; behind the Adheſions of theſe two Membranes to the Vertebræ of the Loins; near the Bifurcation of the Aorta; and along the Iliac Veſſels. There are likewiſe other ſuch Glands on the outſide of the Abdomen, in the Subſtance, and toward the inſide of the Membrana Adipoſa.

596. In the ſuperiour Extremities of the Body, theſe Glands lie chiefly under the Articulation of the Os Humeri with the Scapula, in the hollow of the Axilla. The moſt conſiderable Lymphatic Glands in the lower Extremity are toward the lower part of the Inguina, commonly called the Inguinal Glands, to which the Faſcia Lata or Crural Aponeuroſis gives a kind of double Capſula, which makes ſome of them lie very near the Skin, and the reſt at a greater diſtance from it.

597. As all theſe Lymphatic Glands differ more in Situation, than in Size or Figure, they are commonly enumerated and denominated from the places already mentioned, where they lie in the following Order.

Glandulæ Parotides Lymphaticæ.
Glandulæ Maxillares Lymphaticæ.
Glandulæ Jugulares.
Glandulæ Cervicales.
Glandulæ Occipitales.
Glandulæ Claviculares.
Glandulæ Axillares.
Glandulæ Thoracicæ.
Glandulæ Œſophagææ.
Glandulæ Mediaſtinæ.
Glandulæ Cardiacæ.
Glandulæ Ventrales Externæ, Internæ.
Glandulæ Stomachicæ.
Glandulæ Hepaticæ.
Glandulæ Cyſticæ.
Glandulæ Epiploicæ.
Glandulæ Meſentericæ.
Glandulæ Lumbares.
Glandulæ Iliacæ.
Glandulæ Inguinales.
Glandulæ Crurales, &c.

598. There are three ſorts of Veſſels that now go by the name of Lymphatics, whereas formerly that word was uſed only to ſignify the tranſparent Veſſels already mentioned, which accompany the Lymphatic Glands. The original Sources of theſe Veſſels are very difficult to be found out; and even their Diſtribution through the Body has not been ſufficiently traced to enable us to deſcribe them particularly in this Treatiſe, and therefore I muſt reſerve that for the Subject of another. As to their Termination, we are ſure that for the moſt part they end in the Ductus Thoracicus.

599. Besides theſe Veſſels which accompany the Glands, there are others of the ſame Structure found on the ſeveral Viſcera, where no Lymphatic Glands have hitherto been diſcovered. We meet with them in very great numbers in the external Membrane of the Liver, and in the Duplicature of the ſuperiour membranous Ligament of this Viſcus, as I have already obſerved. Several Diſcoveries have been made about theſe Veſſels in Brutes, which I here paſs over in ſilence, the ſole deſign of this Work being to deſcribe the Human Body.

600. The third ſort of Veſſels termed Lymphatics, are the ſmall Arteries and Veins which in the natural ſtate, tranſmit only the ſerous part of the Blood. Theſe Veſſels differ from thoſe of the firſt in the ſmallneſs of their Diameter, and in their Structure and Situation. All theſe little Arteries and Veins are uniform, extremely narrow, and though their ſides are not thinner than thoſe of the Valvular Lymphatics, yet their Diameters are generally leſs. The other Lymphatics are full of Valves, and very thin, but they are not narrow in proportion. The Arterial and Venal Lymphatics are found on the parts which are naturally white, as on the Skin, the white of the Eye, &c. and their Origins are eaſily diſcoverable; but the Valvular Lymphatics are confined to the internal Parts of the Body, and are found on Parts of all Colours that are in the Body, and we cannot eaſily trace them to their Original Sources.

601. Besides what has been here ſaid about the Glands, I have explained ſeveral things relating to them in the Compendious View, in the Deſcription of the Liver, and in the Deſcription of the Cortical Subſtance of the Brain. I have only here to add, that in order to have a general Enumeration of all the Glands of the Human Body, we need only add to the Salival and Lymphatic Glands, all the particular Glands and glandular Viſcera which have been explained in the Deſcriptions of the Abdomen, Thorax and Head.

602. I think it very proper that the ancient Diviſion of Glands into Conglobate and Conglomerate ſhould be retained. Under the firſt kind I include the Lymphatic Glands alone, and all the other Glands of the Body under the ſecond; and theſe again may be ſubdivided into Simple and Compound. I muſt be obliged to refer what ſtill remains to be ſaid concerning the internal Structure of Glands and glandular Bodies to a particular Diſſertation, which is deſigned to contain an Anſwer to *M. Helvetius*'s Letter publiſhed at the End of his late Performance concerning the Pulmonary Blood.

*FINIS.*

# The Explication of the FIGURES.

## Table AA, the xxv. of *Euſtachius.*

### *Lanciſi*'s Explication.

a. The Heart with the Vena Cava annexed.
b. The External Jugular Vein of the right Side, cut.
c. Vena Jugularis Interna.
d. d. Venæ Subclaviæ.
e. e. Venæ Axillares.
f. f. The Cephalic Veins of both ſides.
g. g. Venæ Medianæ.
h. Vena Baſilica Dextra.
i. i. Arteriæ & Venæ Renales or Emulgentes.
k. k. The Paſſage of the Aorta, hid by the Diaphragm, viewed on the under ſide.
l. l. Arteriæ & Venæ Iliacæ, which afterwards become Crurales, &c.
m. Vaſa Pudica.

### Additional Explication.

n. The Vaſcular Arch on the Palm of the Right Hand.
o. Another Diſtribution of the Veſſels of the Left Hand.
p. The Arch or Curvature of the Trunk of the Aorta.
p. Aorta Inferior.
q. Vena Cava Superior.
r. Vena Cava Inferior, as it paſſes through the Diaphragm.
s. Vena Cava Inferior, as it paſſes behind the Liver.
t. The left Iliac Vein.
u. u. Arteriæ & Venæ Crurales, or Crurales Superiores.
x. x. Arteriæ & Venæ Crurales Inferiores.
y. y. y. y. The two Tibiæ.
z. z. The Tendon of the Rectus Anterior, cut off.
1. 1. 1. 1. The Muſculus Vaſtus Externus inverted.
2. 2. Vaſtus Internus.
3. 3. Crureus.
4. 4. Muſculus Faſciæ Latæ.
5. 5. Triceps.
6. 6. The Kidneys.
7. 7. Muſculus Latiſſimus Dorſi.
8. 8. Trapezius.
9. 9. Deltoides.

10. 10. Biceps.
11. 11. Anconæus Maximus.
12. 12. Supinator Longus.
13. Ulnaris Externus.
14. The Radialis Internus, cut.
15. The Ulnaris Gracilis or Palmaris, cut.
* Vena Jugularis & Arteria Carotis.
* * Venæ & Arteriæ Frontales.
17. Venæ & Arteriæ Temporales.
18. Venæ & Arteriæ Occipitales.
19. Muſculus Perforatus.
20. 20. Gaſtrocnemii.
21. 21. Soleus.

## Table B B, the xviii. of *Euſtachius.*

### *Lanciſi*'s Explication.

Fig. II.

a. a. Nervi Olfactorii.
b. b. The Nervi Optici, cut.
c. c. Motores Oculorum communes.
d. d. Nervi Pathetici.
e. Proceſſus Annularis.
f. f. The three Branches of the fifth Pair.
g. g. The ſixth Pair.
h. h. The two Portions of the Nervi Auditorii.
i. i. i. i. The Origin of the eighth Pair.
m. m. Nervi Recurrentes.
n. The left Nerve of the ninth Pair.
o. The right Nerve of the ninth Pair.
p. p. Corpora Pyramidalia.
q. q. The tenth Pair cut, according to *Lanciſi*'s Explication of theſe two white Points; but as theſe two Marks are not to be found in the other four Figures of the Brain, this Explication is without Foundation.
r. r. The ſuperiour Extremity of the Nerves, commonly called Intercoſtales, which according to *Lanciſi*, may be reckoned an eleventh Pair.
s. s. s. The great Trunks of theſe Nerves.
t. u. u. The Nervus Acceſſorius of the eighth Pair, and its Communication with the third Pair of the Vertebrales.
x. x. x. The Nervi Diaphragmatici, of which the Left is naturally longer than the Right.
y. The inferiour Opening of the Infundibulum.
z. z. The Nerves which go to the Teſtes, Uterus, &c.

i. Os Hyoides.
k. Glandulæ Sublinguales.
l. Glandula Thyroidæa.
m. The Appendix of that Gland.

### Addition.

n. Muſculus Sterno-Thyroidæus.

### Fig. VI. and VII.

Theſe two Figures are nearly the ſame with the ſecond.

### Fig. VIII.

a. Aſpera Arteria.
b. Œſophagus.
c. c. Muſculus Collii Longus.
d. The Glandula Thyroidæa, which appears to be divided.
e. The Appendix to that Gland, according to *Morgagni*.
f. f. Muſculi Crico-Thyroidæi.
g. Cartilago Thyroides.
h. Muſculus Thyro-Pharyngæus.
i. Muſculus Stylo-Pharyngæus Siniſter.
k. The Tendon and common Inſertion of that Muſcle.
l. l. Muſculi Baſio-Gloſſi. That on the right Side appears like a Genio-Gloſſus.
m. Os Hyoides.
n. Muſculus Genio-Hyoidæus Obliquus, which is more properly named Genio-Gloſſus.
o. Genio-Hyoidæus Rectus. It appears here like a Portion of the Baſio-Gloſſus.
q. Stylo-Gloſſus.

### Fig. IX. and X.

The Oſſicula Auditus. The Stapes and Muſcle of the Malleus were diſcovered by *Euſtachius*.

### Fig. XI.

a. a. Muſculi Baſio-Gloſſi. That on the right ſide appears here like a Genio-Hyoidæus.
b. Cerato-Gloſſus Siniſter.
c. Stylo-Gloſſus Siniſter.
d. Stylo-Pharyngæus Siniſter.

e. Œſophagæus. This appears rather to be the Thyro-Crico-Pharyngæus, raiſed and inverted.
f. Stylo-Hyoidæus Siniſter.
g. Crico-Thyroidæus Siniſter.
h. Aſpera Arteria.
i. A Portion of the Œſophagus, cut off.

### Addition.

k. The Ligament of the Stylo-Gloſſus.
l. Muſculus Cerato-Pharyngæus.
m. Syndeſmo-Pharyngæus. Theſe two Muſcles cover the middle Portion of the Stylo-Pharyngæus.
n. The lower Portion of the Stylo-Pharyngæus, inſerted partly in the Cartilago Thyroides, and partly in the Cornu of the Os Hyoides.
o. The Baſis of the Os Hyoides.
p. The left Cornu of that Bone.
q. Cartilago Thyroides.

## Fig. XII.

a. The Baſis of the Os Hyoides.
b. The Notch and left Side of the Cartilago Thyroides.
c. Muſculus Hyo-Thyroidæus Siniſter.
d. Sterno-Thyroidæus Siniſter.

### Addition.

e. A ſmall diſtinct Muſcle.
f. Another.
g. The Baſis of the Os Hyoides.
h. The left Great Cornu.
i. The left Small Cornu or Appendix.

## Fig. XIII.

a. Muſculus Pterygoidæus Internus.
b. Pterygoidæus Externus.
c. The Muſculus Colli Longus Superior of the left Side, which is likewiſe called Rectus Anterior.
d. Longus Colli Inferior of the right Side.

### Addition.

e. Muſculus Salpingo-Staphylinus, or rather the Ptery-Salpingoides.
f. The Obliquus Anterior of the right ſide.

g. g. Recti Minores ſive Laterales Anteriores.
h. h. The Lower Jaw divided by the Chin.

### Fig. XIV.

This Figure does not appear in Human Subjects.

## Table D D. the xlii. of *Euſtachius*.

### *Lanciſi*'s Explication.

### Fig. I.

a. The Epiglottis raiſed a little.
b. b. The two Tops or ſmall Heads of the Cartilagines Arytenoides.
c. The left Ala of the Cartilago Thyroides, extra ſitum.
d. The Superiour Apophyſis or Cornu of that Ala.
e. The Inferiour Apophyſis or Cornu.
f. The right Ala, in ſitu.
g. Muſculus Thyro-Arytenoidæus Siniſter.
h. Crico-Arytenoidæus Lateralis.
i. Crico-Arytenoidæus Poſterior.
k. k. Arytenoidæus.
l. Aſpera Arteria.
m. A Portion of the Muſculus Œſophagæus. This appears rather to be the membranous Portion of the Aſpera Arteria.

### Addition.

n. The left, ſmall, lateral, articular ſide of the Cartilago Cricoides, with which the inferiour Apophyſis of the Cartilago Thyroides, is articulated.

### Fig. II.

a. The inner ſide of the Epiglottis.
b. b. Muſculi Arytenoidæi.
c. c. Crico-Arytenoidæi Poſteriores.
d. d. The poſteriour and lower ſide of the Cartilago Cricoides.

### Addition.

e. The Prominent Line on the backſide of the Cricoides.
f. Muſculus Arytenoidæus Verus.
g. g. The Heads of the Cartilagines Arytenoides.
h. h. The ſuperiour Cornua of the Cartilago Thyroides.
i. i. The inferiour Cornua.

Fig.

### Fig. III.

a. Rimula Laryngis
b. Muſculus Hyo-Thyroidæus ſiniſter.
c. Sterno-Thyroidæus ſiniſter.
d. Pharynx.
e. Œſophagus.

Addition.

If this Figure be taken from an Human Subject, it is a very extraordinary one.

### Fig. IV. and VI.

a. The Point of the Tongue.
b. The Baſis of the Tongue.
c. c. and d. d. The Muſculi Stilo-Gloſſi cut; according to *Lanciſi*.
e. e. and f. f. Stylo-Pharyngæi.
g. g. Cephalo-Pharyngæi, united by a Linea Alba.
h. h. Œſophagæus; or rather the Cerato-Syndeſmo-Pharyngæus.
i. The Opening of the Pharynx.
k. k. Œſophagus,
l. l. Aſpera Arteria.

Addition.

m. Muſculus Hyo-Crico-Pharyngæus.
n. n. Gloſſo-Pharyngæi.
o. A Portion of the Stylo-Pharyngæus.
p. p. p. p. The Velum or Septum Palati.
q. q. The Arch of the Pharynx, with the Rugæ.
r. r. Muſculi Petro Pharyngæi.
s. Stylo-Pharyngæus Minor *D. Santorini*.
t. t. t. t. Peryſtaphylini Externi.

### Fig. V.

a. The Tongue.
b. Epiglottis.
c. Ligamentum Epiglotticum *Morgagnii* ſive Gloſſo-Epiglotticum.
d. Ligamentum Hyo-Epiglotticum Siniſtrum.
e. Os Hyoides.
f. The Glands of the Baſis of the Tongue.

### Fig. VII.

A Fore-View of the Cartilago Cricoides.
a. The Forepart.
b. The Backpart.
c. c. The ſmall articular Heads or Tops.

## Fig. VIII.

A Side-View of the Cricoide Cartilage, in which the ſmall articular Surface expreſſed in Fig. I. is left out.

a. The anteriour Part or Baſis.
b. The poſteriour or upper part.
c. The lateral part, in which the ſmall articular Surface is wanting. Vide Fig. 1. n.

## Fig. IX.

a. The right ſide of the Cartilago Thyroides.
b. The right ſide of the Cartilago Cricoides.
c. Epiglottis.
d. The right ſuperiour cornu of the Cartilago Thyroides.
e. The left ſuperiour Cornu.
f. The right inferiour Cornu.

## Fig. X.

A Back View of the Cartilago Cricoides.
a. The prominent Line.
b. b. The lateral ſides.
c. c. The ſmall articular Eminences or Heads.

## Fig. XI.

a. Epiglottis.
b. The right ſuperiour Cornu of the Cartilago Thyroides.
c. The Superiour Portion or Head of the right Arytenoide Cartilage.
d. d. The Orifice of the right Ventricle of the Larynx.
e. The right Portion of the Cricoides.
g. An anteriour Section of the Cricoides.
h. A poſteriour Section.

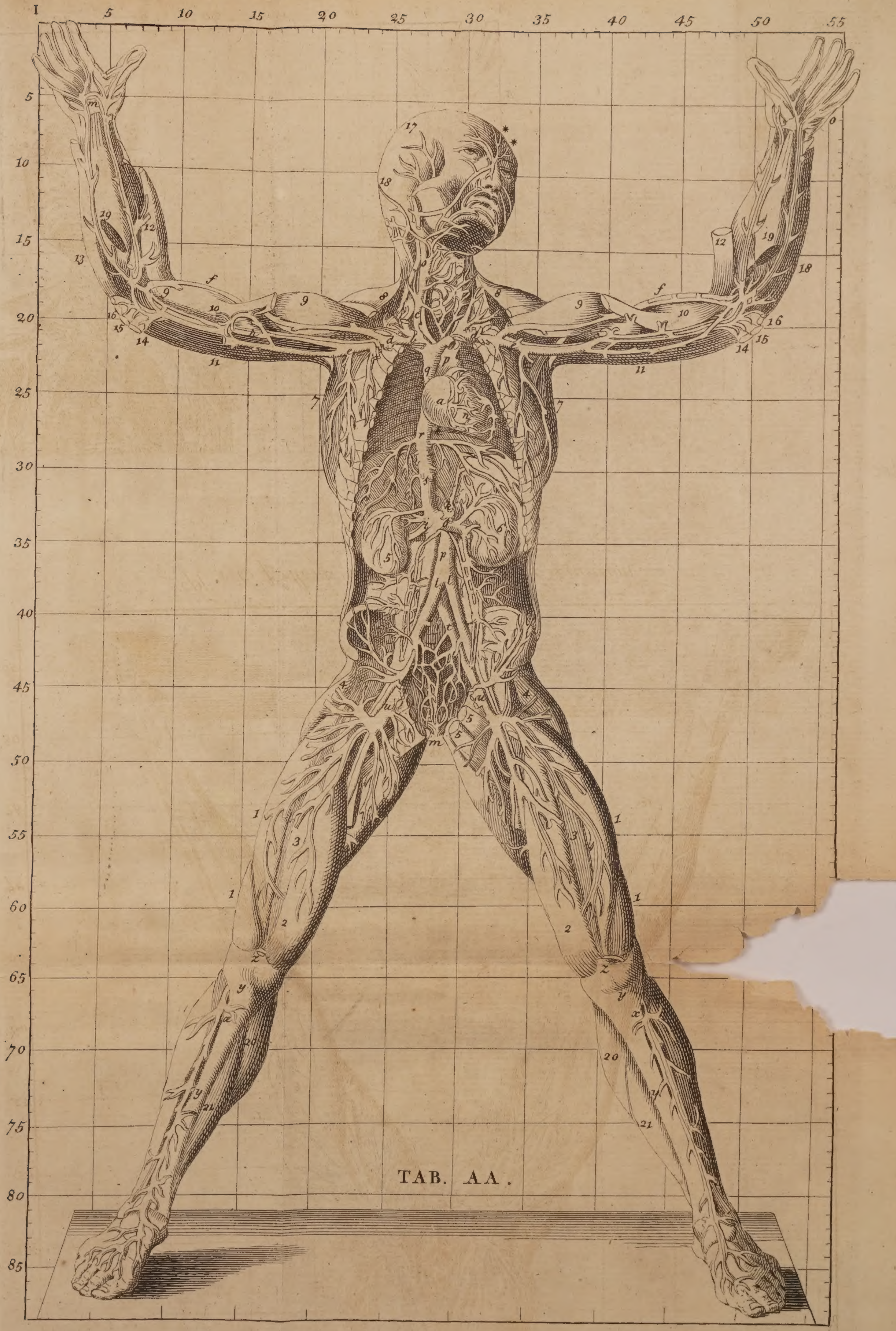
## Fig. XII.

One of the Arytenoide Cartilages cleared from the Muſcles.

## Addition.

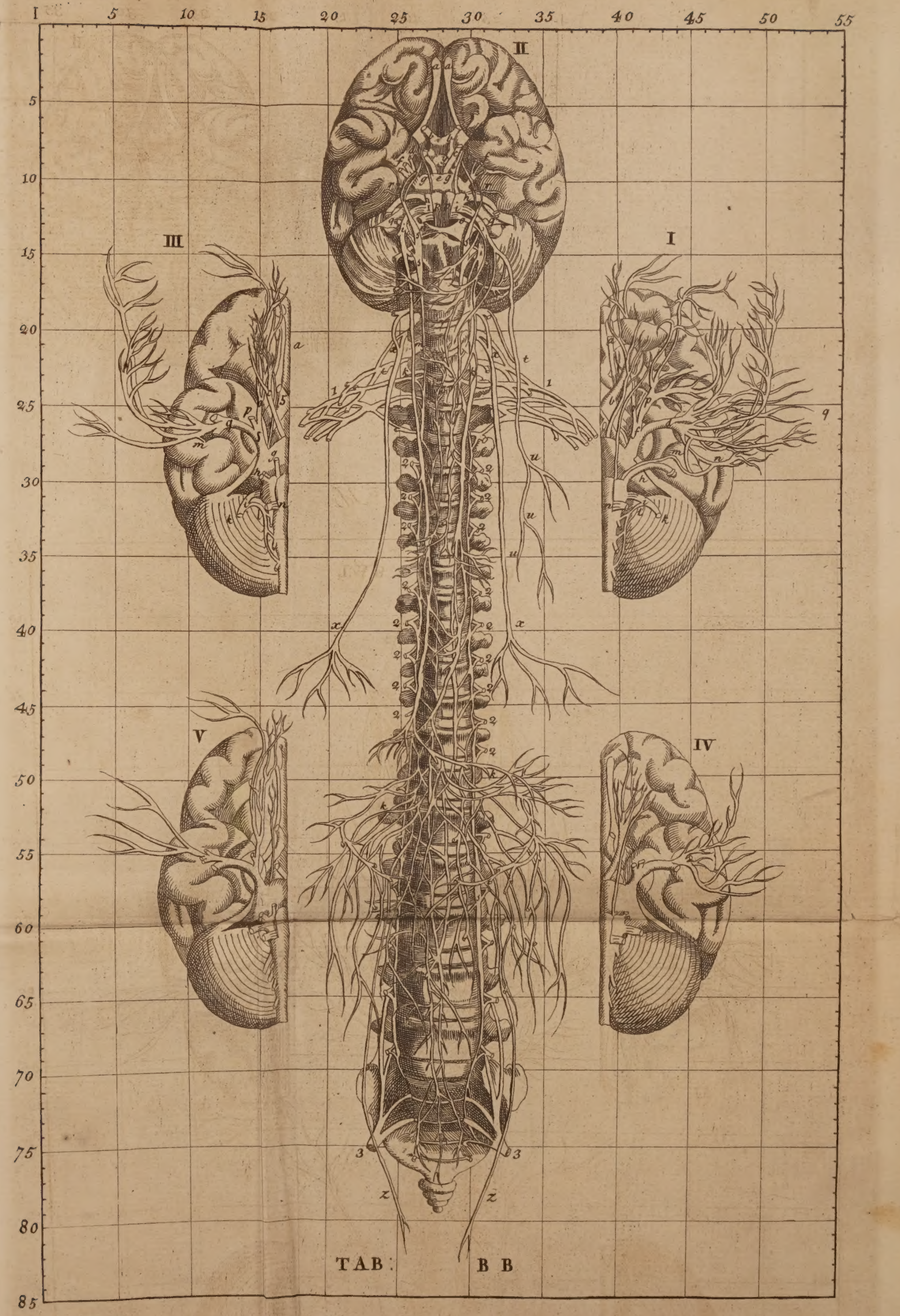
a. b. The Baſis of this Cartilage.
b. The internal Angle of the Baſis.
c. The articular Cavity of the Baſis.
d. The Appendix or ſmall Head of this Cartilage.

* * *



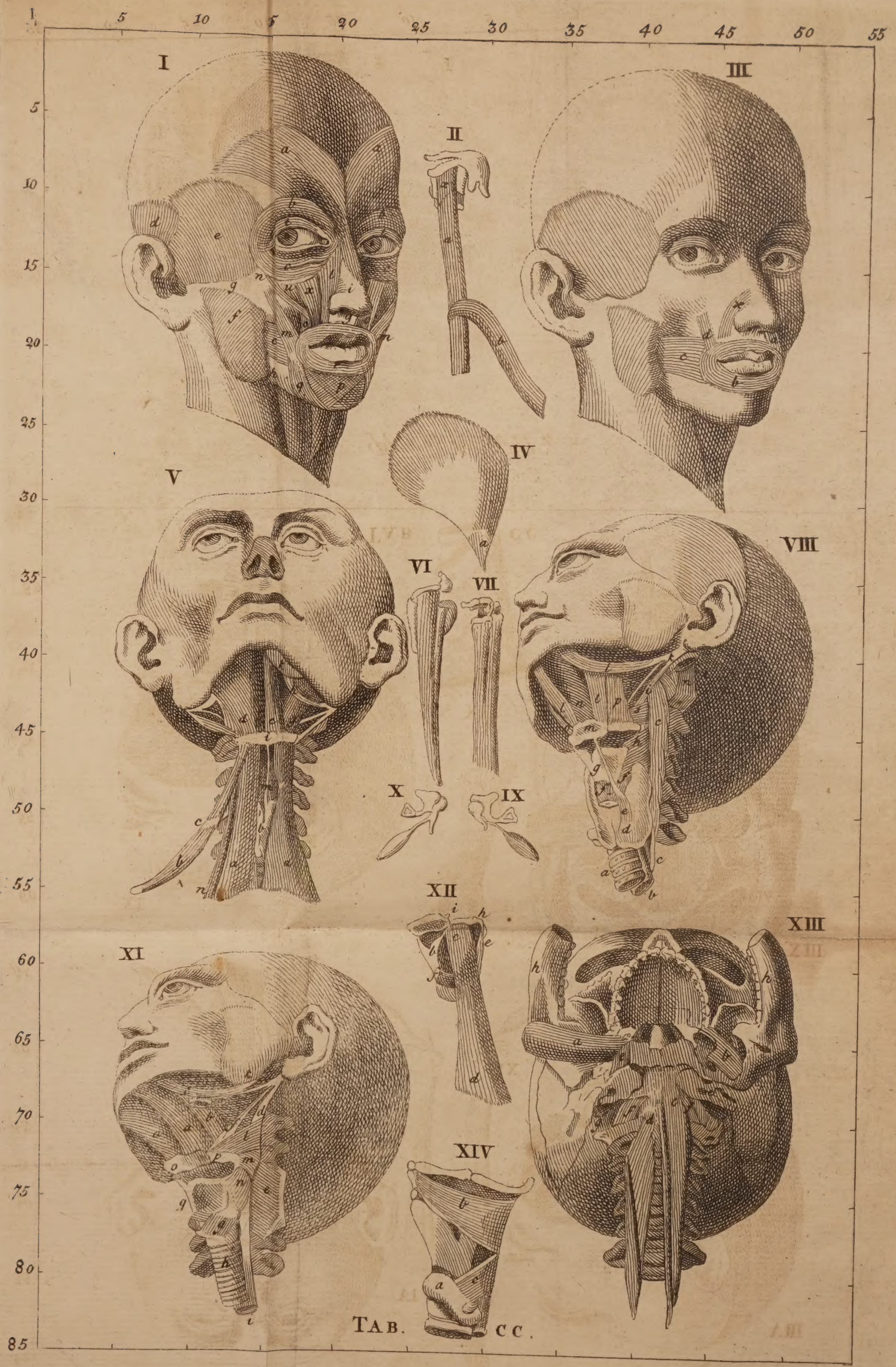
TAB. AA.

*Pl. 1. to follow the last Page of the Explication.*



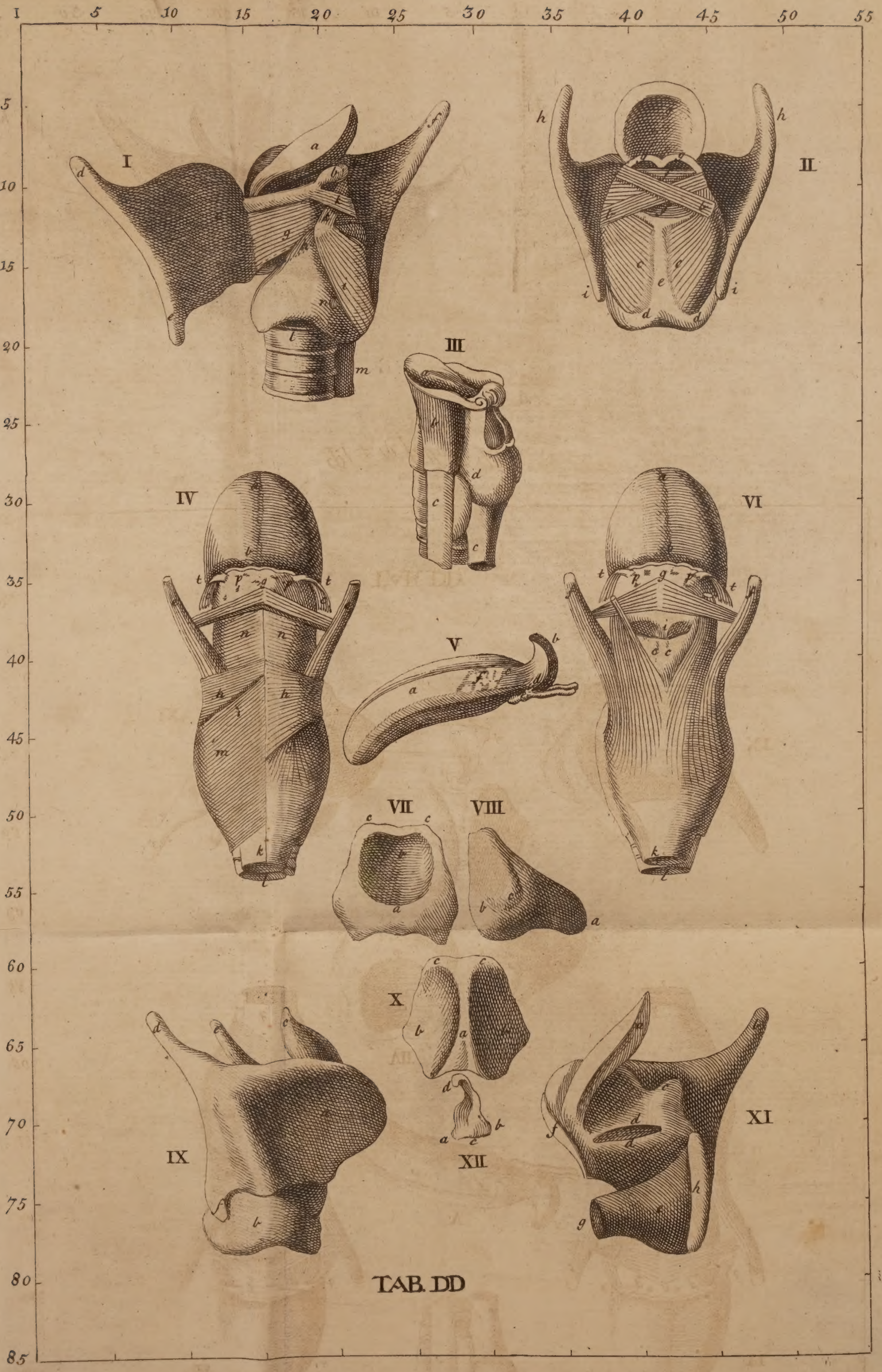
TAB. B B

*Pl. 2. to follow Pl. 1.*



TAB. CC.

*Pl. 3. to follow Pl. 2.*



TAB. DD

Pl. 4. to follow Pl. 3.